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# PIPELINE & GAS JOURNAL

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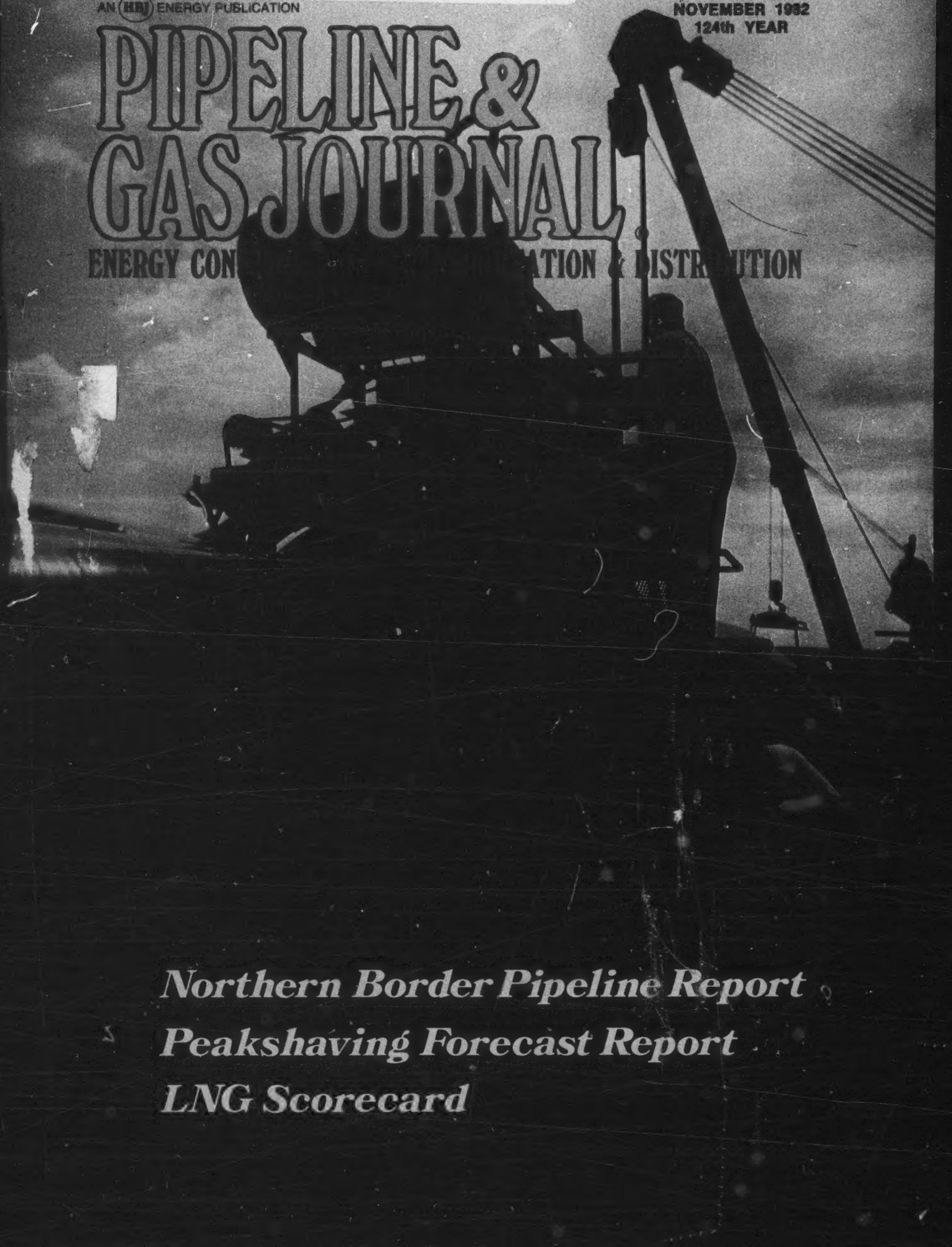

*Northern Border Pipeline Report*

*Peakshaving Forecast Report*

*LNG Scorecard*

# PIPELINE & GAS JOURNAL

*International Pipeline & Gas Utility Design, Construction & Operation*

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Gas is now flowing through the $1.4-billion, 823-mile, 42-in. Northern Border Pipe Line from Port of Morgan on the Canadian-U.S. border to Ventura, Iowa, delivering 800 MMcf per day.

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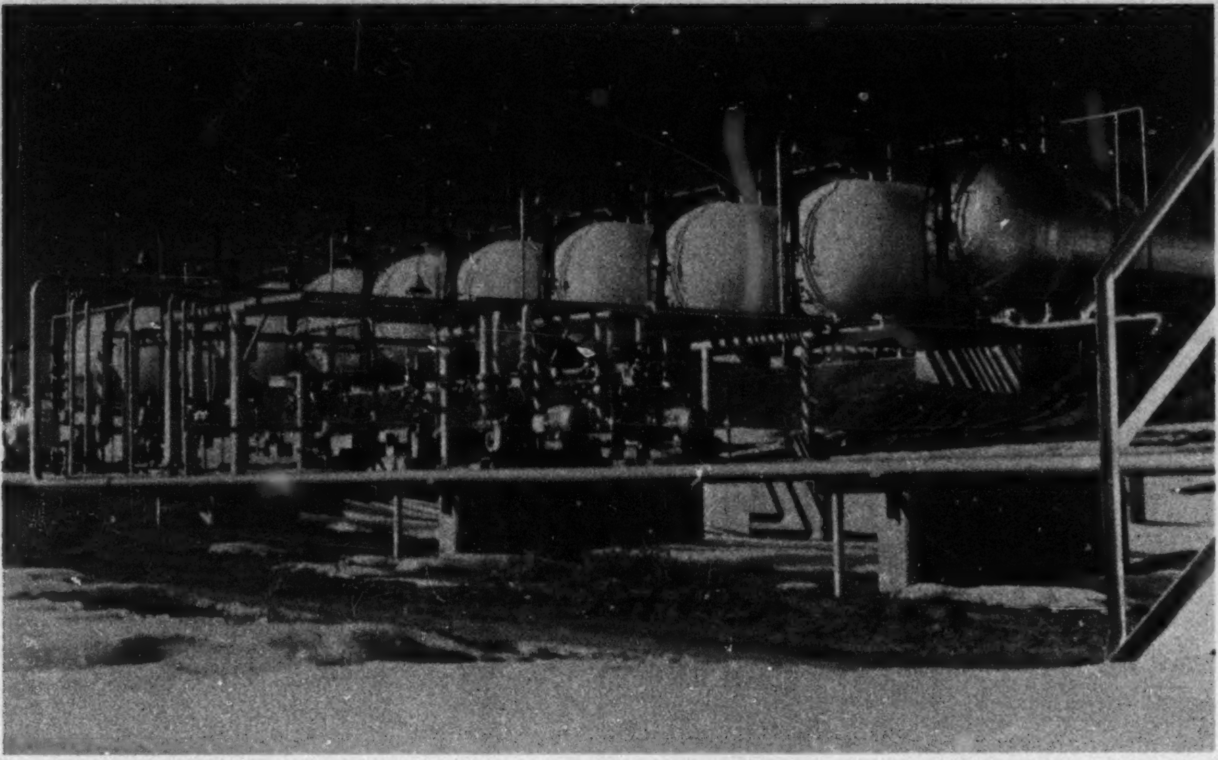
Short but essential 8-in. products pipeline connects Gulf Pipeline Co.'s Mesquite Products System to the Cleburne, Tex., facilities of the Santa Fe Railway, transporting diesel fuel for locomotives.

**COVER**
Taping gang at work on one of the final sections of the Northern Border Pipe Line during summer of 1982.
*– photo courtesy Northern Plains Natural Gas Co.*



**Propane-air plant sendout gas** provides only 7.14% of the total 73.54 Bcf maximum delivery capacity of the nation's gas industry peakshaving facilities, but for the companies who depend upon it to "shave" the very highest wintertime peak demands, it is an extremely valuable resource..

# Peakshaving Capacity Reaches Record Total For 1982-83 Winter

by Dean Hale, *Editor*

The winter of 1982-83 is expected to prove interesting and frustrating to the U.S. natural gas industry at a time when it is faced with a temporary surplus of gas supply, increasing prices from producers and pipelines, customer resistance to higher gas rates, forecasts of a severe winter, and some startling changes in gas usage patterns, particularly in the industrial sector, that could affect peakshaving operations.

Even though total gas sales are down slightly for 1982 (through September), there are still some 40 million gas customers who heat their homes with natural gas, and as consumption history has shown in the past several years, those customers abandon their conservation efforts when it really gets cold and put heavy demands on the gas distribution utilities (and pipelines) to provide them sufficient gas supplies when blizzards, blue northers, and extended cold spells occur.

For the gas utilities, that may well mean another record year in peakshaving deliveries as both contract and supplemental sources of gas supply are utilized to insure continued cold weather service.

PIPELINE & GAS JOURNAL's latest annual peakshaving survey indicates that a capacity of 73.54 billion cu ft maximum delivery for one 24-hr period, using gas from all available peakshaving gas sources, could be available if needed. To that can be added an estimated 68.4 Bcf of regularly scheduled deliveries per day to produce a projected maximum delivery in one day that *could* reach 141.94 Bcf. It's highly unlikely that such a figure will be obtained simply because the entire nation seldom experiences a major, nationwide cold spell in all of the 48 contiguous states simultaneously.

For the 1982-83 winter, a top delivery of 78 to 87 Bcf in a single 24-hr period is projected for the industry. Supplemental gas supplies from propane-air plants, LNG peakshaving plants, and underground storage, as well as other sources such as line pack, SNG plants, gas holders, etc., are expected to provide a substantial portion of the gas demand at any one time during the winter season in areas such as the north central and northeastern states where cold weather often prevails for extended periods.

For the 1982-83 winter season, peakshaving supplies will include:

**58.94 Bcf** from underground gas storage
**5.25 Bcf** from propane-air plants
**9.10 Bcf** from LNG peakshaving and satellite plants
**0.25 Bcf** from other sources

The increase in deliverability for the 1982-83 winter season is a small 670 MMcfd, the least amount in 15 years that PIPELINE & GAS JOURNAL has been examining, surveying, and forecasting the gas industry peakshaving requirements. Underground gas storage customarily accounts for a significant amount of the yearly increase; there was a large increase in storage capacity during the year, from the addition of major new facilities, but much of it was offset by the abandon-

## U.S. Underground Gas Storage Operations — Operating Companies — 1980 Data

| Company | No. of Fields | No. of Wells | Miles Storage Lines | Storage Compressor Stations | |
|---|---|---|---|---|---|
| | | | | No. | Hp. |
| ANR Storage Co. | 4 | 40 | 21.80 | 3 | 26,250 |
| Arkansas Louisiana Gas Co. | 5 | 73 | 39.00 | 5 | 42,200 |
| Arkansas Oklahoma Gas Corp. | 1 | 12 | 3.00 | 1 | 370 |
| Arkansas Western Gas Co. | 4 | 12 | 3.72 | 4 | 2,355 |
| Battle Creek Gas Co. | 3 | 3 | 2.00 | 2 | 1,050 |
| | | — (1 under development) — | | | |
| Bear Creek Storage Co. | 1 | 52 | 25.5 | 1 | 28,000 |
| Brady, Tex., Municipal Gas Corp. | 1 | 2 | 2.00 | 1 | 420 |
| Cabot Corp. | 2 | 13 | 14.60 | 2 | 2,395 |
| Central Illinois Light Co. | 2 | 81 | 21.27 | 2 | 4,000 |
| Central Illinois Public Service | 3 | 78 | 9.80 | 3 | 3,220 |
| | | — (1 under development) — | | | |
| Cities Service Gas Co. | 10 | 589 | 164.00 | 6 | 29,800 |
| Citizens Gas & Coke Utility | 8 | 182 | 319.00 | 2 | 3,695 |
| Colorado Interstate Gas Co. | 4 | 122 | 230.00 | 3 | 9,700 |
| Columbia Gas Transmission Corp. | 49 | 3,725 | 1,221.50 | 27 | 108,925 |
| Columbia Gas of Pennsylvania | 1 | 8 | 3.43 | 1 | 900 |
| Consolidated Gas Supply Owned | 9 | 1,054 | 458.00 | 9 | 119,300 |
| Joint | 4 | 296 | 117.00 | 8 | 60,390 |
| | 13 | 1,349 | 575.00 | 17 | 179,690 |
| Consumers Power Co. | 11 | 477 | 128.66 | 4 | 78,810 |
| Delhi Gas Pipeline Corp. | 1 | — (under development) — | | | |
| East Ohio Gas Co. | 4 | 757 | 257.90 | 3 | 20,220 |
| El Paso Natural Gas Co. | 2 | 35 | 39.00 | 1 | 4,400 |
| | | — (1 under development) — | | | |
| Egyptian Gas Storage Co. | 2 | 3 | — | — | — |
| Equitable Gas Co. | 15 | 280 | 128.33 | 8 | 15,340 |
| Felmont Oil Corp. | 1 | 10 | 6.00 | 1 | 1,050 |
| Gas Utilities (Ill.) | 1 | 4 | 3.10 | — | — |
| Hampshire Gas Co. | 1 | 13 | 17.00 | 1 | 1,640 |
| Honeoye Storage Corp. | 1 | 34 | 15.80 | 1 | 2,200 |
| Hoosier Gas Corp. | 3 | 24 | 8.30 | 0 | — |
| Houston Pipe Line Co. | 1 | 59 | 12.00 | 4 | 23,010 |
| Illinois Power Co. | 8 | 236 | 34.75 | 8 | 12,100 |
| Indiana Gas Co. | 7 | 273 | 104.81 | 4 | 2,770 |
| Kane Gas Light & Heat Co. | 1 | 14 | 10.00 | 1 | 60 |
| Kansas Nebraska Natural Gas | 4 | 34 | 23.40 | 3 | 5,530 |
| Laclede Gas Co. | 1 | 50 | 32.08 | 1 | 9,020 |
| Lawrenceburg Gas Co. | 1 | 1 | — | — | — |
| Lone Star Gas Co. | 11 | 109 | 78.04 | 9 | 24,770 |
| Louisville Gas & Electric Co. | 9 | 837 | 126.16 | 3 | 19,055 |
| Michigan Consolidated Gas Co. | 5 | 514 | 90.00 | 4 | 71,000 |
| Michigan Gas Storage | 3 | 554 | 166.10 | 1 | 30,900 |
| Michigan Gas Utilities Co. | 3 | 8 | 3.75 | 2 | 1,500 |
| Michigan Wisconsin Pipe Line Co. | 15 | 1,254 | 316.00 | 10 | 110,700 |
| | | — (1 under development) — | | | |
| Midwestern Gas Transmission Co. | 3 | 55 | 11.70 | 2 | 1,593 |
| Minnesota Gas Co. | 2 | 40 | 15.00 | 1 | 2,200 |
| Mississippi River Transmission Corp. | 3 | 66 | 72.06 | 3 | 22,050 |
| Mississippi Valley Gas Co. | 1 | 3 | 1.00 | 1 | 584 |
| Montana-Dakota Utilities Co. | 3 | 87 | 103.00 | 3 | 22,122 |
| Montana Power Co. | 4 | 39 | 38.00 | 3 | 5,960 |
| Mountain Fuel Resources, Inc. | 1 | 44 | 21.76 | 1 | 13,000 |
| Mountain Fuel Supply Co. | 3 | 26 | 10.00 | 3 | 6,000 |
| Mustang Fuel Corp. | 1 | 1 | 4.00 | — | — |
| National Fuel Gas Supply Corp. owned | 26 | 909 | 486.80 | 15 | 25,825 |
| joint | 4 | 379 | 63.10 | (4) | (39,900) |
| Total | 30 | 1,288 | 549.90 | 15 | 25,825 |
| | | — (3 under development) — | | | |
| National Gas & Oil Corp. | 3 | 31 | 8.00 | 3 | 1,950 |
| National Zinc Co. | 1 | 7 | — | 1 | 119 |
| Natural Gas Pipeline Co. of America | 13 | 850 | 305.00 | 8 | 119,040 |
| North Penn Gas Co. owned | 2 | 18 | 12.66 | 1 | 4,995 |
| (joint | 1) | | | | |
| Northern Gas Co. | 4 | 8 | 12.00 | 4 | 2,183 |
| Northern Illinois Gas Co. | 7 | 505 | 264.03 | 6 | 113,990 |
| Northern Indiana Public Service | 2 | 135 | 29.00 | 2 | 7,320 |
| Northern Natural Gas Co. | 3 | 306 | 185.80 | 2 | 21,160 |
| Oklahoma Natural Gas Co. | 4 | 60 | 22.00 | 2 | 11,200 |
| Pacific Gas & Electric Co. | 3 | 94 | 22.47 | 3 | 14,990 |
| Panhandle Eastern Pipe Line Co. | 5 | 241 | 114.00 | 5 | 19,350 |
| Peoples Gas Light & Coke Co., The | 1 | 138 | 189.50 | 1 | 14,900 |
| Peoples Natural Gas Co. | 8 | 74 | 37.00 | 7 | 12,520 |
| T.W. Phillips Gas & Oil Co. | 7 | 74 | — | 7 | 1,995 |
| Phillips Petroleum Co. | 3 | 6 | 22.00 | 2 | 620 |
| Pioneer Natural Gas Co. | 2 | 1 | 1.00 | 1 | 880 |
| | | — (1 under development) — | | | |
| Public Service Co. of Colorado | 1 | 13 | 8.27 | 1 | 17,000 |
| South Louisiana Production Co. | 1 | 3 | 10.00 | 1 | 30 |
| Southeastern Michigan Gas Co. | 3 | 8 | 2.00 | 3 | 3,920 |
| Southern Indiana Gas & Electric Co. | 2 | 83 | 17.30 | 2 | 1,500 |
| Southern Natural Gas Co. | 1 | 72 | 48.22 | 1 | 21,750 |
| Southern California Gas Co. & | 6 | 325 | 124.28 | 6 | 104,090 |
| Pacific Lighting Gas Supply Co. | | — (1 under development) — | | | |
| Southern Union Co. (Gas Co. of New Mex.) | 1 | 12 | 12.00 | 1 | 3,000 |
| Southwest Gas Corp. | 1 | — (1 under development) — | | | |
| Southwest Gas Storage Co. | 1 | 49 | 18.00 | 1 | 6,000 |
| Southwestern Gas Pipeline, Inc. | 2 | 11 | 3.45 | 1 | 440 |
| Tennessee Gas Pipeline Co. (joint) | 5 | 406 | 2.00 | 2 | 19,600 |
| Texas Eastern Transmission Corp. owned | 1 | 75 | 13.20 | 1 | 11,000 |
| Texas Gas Transmission Corp. | 10 | 457 | 217.26 | 11 | 19,765 |
| Transcontinental Gas Pipe Line Corp. owned | 3 | 57 | 22.45 | 3 | 46,100 |
| (joint | 2 | 181 | 79.00 | 1 | 34,300) |
| Trunkline Gas Co. | 1 | 86 | 27.00 | 1 | 15,400 |
| Union Gas System, Inc. | 4 | 94 | 19.80 | 1 | 165 |
| United Gas Pipe Line Co. owned | 1 | 19 | 6.10 | 1 | 2,550 |
| joint | 1 | 73 | 21.70 | 1 | 34,000 |
| Total | 2 | 92 | 27.80 | 2 | 36,550 |
| Valero Gas Storage Co. | 1 | 2 | n.a. | 1 | 8,000 |
| | | — (under development) — | | | |
| Victor Gas Co | 1 | 6 | 12.00 | 2 | 300 |
| Washington Natural Gas joint<br>Washington Water Power Co.<br>Northwest Pipeline Corp. | 1 | 77 | 9.90 | 1 | 12,500 |
| Western Kentucky Gas Co. | 6 | 60 | 203.04 | 4 | 1,555 |
| Western Slope Gas Co. | 3 | 37 | 27.34 | 2 | 3,368 |

ment of older facilities that became uneconomical to maintain and operate. Deliverability from LNG peakshaving increased very slightly with the beginning operation of one major new facility. Propane-air plant additions, significant in several previous years, continued to decline with only one plant reported as new and some smaller additions to existing plants and to propane storage capacity. The remaining "other" sources also declined slightly – sendout from SNG plants operated to make peakshaving gas supplies is very costly because the feedstocks (naphtha and other hydrocarbons) remain very expensive and such plants operate only if absolutely necessary. Other sources also include the line pack, gas holders, some buried bottle-type storage, and enrichment of gas stream by direct injection of propane or ethane to boost the Btu content of the gas stream.

### Underground Gas Storage

Gas distribution companies and gas pipelines continue their search for new underground gas storage containers – abandoned oil and gas fields, aquifers, salt domes, and tight caverns with an eye to the future. With emphasis on more efficient utilization of gas energy and on conservation, industry planners have noted that nearly every Mcf of new sales will require a certain amount of peakshaving capacity – ranging from 0.3 to 0.8 Mcf for every Mcf unit of demand. Each company's need is different – but all of them report a need.

During 1982, the gas industry spent more than $248 million for new underground gas storage facilities (compared to $314 million in 1981) and early projections for 1983 indicate that over $227 million will be spent for storage facilities – drilling and completing injection and withdrawal wells, observation wells, installing field lines, and installing compressor horsepower and related measurement, dehydrating, filtering, and odorization equipment and control systems and communications systems.

As of Nov. 1, 1982, there were 399 gas storage fields being operated or developed by 91 companies, including 387 fields considered active, another 12 under development or planned. Maximum deliverability of the 387 fields is estimated at 58.939 Bcf per day in a 24-hr period.

At the 399 operating and under-development gas storage fields, there are 18,314 wells (a net increase of 249 over 1981); 7191 miles of field lines (up 371 over 1981's total), and a net gain of two compressor stations with a net increase of 12,330 hp for the year.

Preliminary data for 1983 indicates that some 170 new wells will be drilled, over 380 will be worked over, 120 miles of field lines planned, and over 20,000 hp to be added. These projections do not include requirements of projects not yet announced.

Current gas storage developments include:

**Pacific Lighting Corp. and Pacific Gas & Electric Co.** have abandoned development of the Ten Section field southwest of Bakersfield, Calif., as an underground gas storage field that would have provided a deliverability capacity of over 1 billion cu ft per day for winter peak demand. PLC and PG&E cited inflation as the reason for discontinuing the project. Original estimate of $142 million (1980 dollars) had increased to $357 million in 1983-84 dollars. Changes in design also increased costs.

**Battle Creek Gas Co.** has added a new field – the Harris Field in Calhoun County, Mich. – for 1982 and plans to add another – Watson-Odell Field in Calhoun County – during 1983.

**Michigan Gas Utilities** has added three new fields to its gas storage operations.

**Northern Natural Gas Co.** plans to develop one new field in 1983 and expand its Redfield (Iowa) storage operations at a total cost of $10 million. Program will add 5 Bcf to NNG's capacity.

**Union Light Heat & Power Co.** is abandoning its storage field activities.

**Valero Gas Storage** is developing two new salt dome caverns that will provide up to 5 Bcf capacity.

## Propane-Air Plants

Propane-air changes were insignificant during 1982. Only one new plant was added to bring the total 504 propane-air plants operated by 242 gas utilities in 41 states. Deliverability increased slightly to 5.25 Bcf per day total, and an estimated 8.5 billion gal. of additional propane storage was added at both new and existing propane-air plants during 1982.

## LNG Peakshaving Developments

**Southwest Gas Corp.'s** H. G. Laub peakshaving plant at Dayton, Nev., is to begin operation in November. Startup of the facility, built under a turnkey contract by CBI, is scheduled for September. An interesting aspect of the project is its innovative financing arrangement. In August, FERC authorized a sale/lease-back arrangement.

A construction trust has been arranged whereby Southwest will lease the facilities for a period of 20 years at a fixed annual rental. Arrangement includes a renewal option for five years at a reduced rental and subsequent renewal options at fair rental value. Southwest also has option to purchase the LNG plant and related pipeline loop at end of the lease or its renewals at a then-current fair market value.

The lease will be a tax deductible operating expense, and will not be capitalized or included in rate base. FERC said this should result in reduced revenue requirements.

**North Carolina Natural Gas Corp.** has announced plans to construct a peakshaving LNG plant in Johnston County, N.C. The plant is to have a liquefaction capacity of 3.5 MMcf per day (net) and will incorporate a mixed-refrigerant cycle. Storage capacity will be 212,000 bbl in an aboveground 9% nickel-steel tank. The type of vaporizer to be used has not been selected, but it will have a capacity of 60 MMcfd at a nominal sendout pressure of 500 psi and a peak rating of 650 psi. Construction will begin after regulatory approvals have been obtained. The facility is scheduled to go on-stream in 1984. North Carolina Natural Gas Corp., an investor-owned utility headquartered in Fayetteville, N.C., has 83,000 customers in 22 communities. Largest of these is Fayetteville. Gas sales are approximately 40 Bcf annually.

**Energy Terminal Services (ETS)** continues to process its application to convert the Staten Island Terminal site into a peakshaving facility. The pace at which progress is being made toward resolving the on-going regulatory approvals is snail-like. ETS' considerable efforts have resulted in some progress in proceedings involving FERC and with respect to Section 7 approvals under the Natural Gas Act, DOT's Materials Transportation Bureau (MTB) with regard to compliance with applicable provisions of Federal Safety Standards under 49CFR Part 193, and the U.S. District Court over jurisdictional matters.

On Jan. 1, 1982, the final provisions of MTB's Liquefied *Natural Gas Facilities; Federal Safety Standards* became effective. Implementation of these provisions had been delayed as they could have involved purchase and installation of new equipment or material. The provisions covered included those involving personnel safety, communications systems, fire and gas detection equipment, fire control equipment, security-related systems, and alternative power sources. The LNG industry has devoted a significant effort during the past two years since these standards were enacted to comply with them. The industry safety record has been outstanding to date and there is every indication that efforts are being sustained to keep it that way.

**In Europe,** activities are slow in the LNG peakshaving area. Principal activities in Europe center about the British Gas Corp., now constructing its sixth and seventh peakshaving facilities at the Isle of Grain and Dyenevor Arms. At Canvey Island, the cryogenic inground storage tanks used for peakshaving since the baseload import from Algeria terminated in mid-1981 have been abandoned. The four 300,000 bbl capacity pits have been filled in with sand. It is intended that the terminal facility will be maintained for peakshaving using its 10.3 MMcf per day liquefier to produce LNG from North Sea gas. The LNG would be stored in the 392,000 bbl capacity available in the six small, conventional tanks. A project has also been completed to use 3000 tons of LPG storage capacity at the facility to supply LPG-air for peakshaving in the regional transmission system.

When the 14 large-capacity LNG storage tanks are completed and operating at the peakshaving facilities throughout the United Kingdom, some 4 million bbl of capacity (1.4 billion cu ft of gas) will be available for peakshaving. From that time in 1983, it is unlikely that the number of sites would be increased for some time as additional peakshaving supplies will be available from salt cavity storage at Hornsea. In addition, seasonal supplies will be available from the Rough gas field, partially depleted but now to be used for storage, and from the new Morecambe Bay field. **P&GJ**

## SCORECARD U.S. and Canadian LNG Peakshaving Facilities November 1982

| Company and Plant Site | Liquefaction Plant Capacity, MMcfd/day | Storage Capacity, | | Total Design Capacity | Regasification—MMcfd | | | Type of Storage Container | Storage Contractor | Liquefaction Plant Contractor | Type of Cycle | Year of Operation |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | MMcf | Mbbl | | Runs | No. of Days | Type | | | | | |
| APCI-NEGEA<br>Hopkinton, Mass. | 18.5 | 2000<br>(2 at 290) | 580 | 248 | 4 at 62 | 8 | Submrgd | Aboveground, 9% nickel | CBI | Cryo-Methane | Cascade | 1967 — plant; 1971 on new tanks |
| APCI-NEGEA<br>Hopkinton, Mass. | — | 1000 | 290 | — | — | — | — | Aboveground, 9% nickel | CBI | — | — | 1975 — third tank |
| ALABAMA GAS CORP.<br>Birmingham, Ala. | 4.85 | 625 | 180 | 127/85 | 3 at 42.5 | 10 | Submrgd | Aboveground, 9% nickel | CBI | Air Products & Chemicals, Inc. | Cascade | 1965 |
| ALABAMA GAS CORP.<br>Birmingham, Ala. | — | 625 | 180 | 42.5 | 1 at 42.5 | | Submrgd | Aboveground, aluminum | CBI | — | — | 1971 — second tank |
| ALABAMA GAS CORP.<br>Coosada, Ala. | 2.7 | 600 | 175 | 80 | 2 at 40 | 15 | Submrgd | Aboveground, aluminum | CBI | CBI | Modified Cascade | 1972 |
| ATLANTA GAS LIGHT CO.<br>Riverdale, Ga. | 10.0 | 1000 | 290 | 200 | 3 at 100 | 5 | Uniflux | Aboveground, aluminum | CBI | Air Liquide | TEAL Expander Process Inpct | 1972 |
| ATLANTA GAS LIGHT CO.<br>Riverdale, Ga. | | 1500 | 450 | — | — | — | — | Aboveground, 9% nickel | CBI | — | — | 1973 |
| ARKANSAS-MISSOURI POWER CO. Yarbro, Ark. | 0.66 | 374 | 110<br>(2 x 55) | 66 | 2 at 33 | 6 | Direct Fired | Aboveground, aluminum | Brown, Minneapolis Tank & Fab. Co. | Process Constructors, Inc. | Stirling | 1973 — (1972 as satellite) |
| BALTIMORE GAS & ELEC. CO.<br>Baltimore, Md. | 2.75 | 500 | 145<br>(2 x 72.5) | 187.5/125 | 3 at 62.5 | 5 | Submrgd | Aboveground, aluminum | CBI | CBI | Expander | 1971 |
| BALTIMORE GAS & ELEC. CO.<br>PLANT No. 2, Baltimore, Md. | 2.4 | 500 | 145 | 62.5 | 1 at 62.5 | 8 | Submrgd | Aboveground, aluminum | CBI | CBI | MRL | 1973 |
| BAY STATE GAS CO.<br>Ludlow, Mass. | 7.5 | 1000 | 290 | 55 | 1 at 25<br>2 at 15 | 20 | Uniflux | Aboveground, 9% nickel | CBI | J. F. Pritchard | PRICO | 1973 |
| BOSTON GAS CO.<br>Boston, Mass. | 6.0 | 1000 | 290 | 187.5/125 | 3 at 62.5 | 8 | Submrgd | Aboveground, 9% nickel | CBI | CBI | Expander | 1968 |
| BOSTON GAS CO.<br>Boston, Mass. | — | 1120 | 331 | — | — | — | — | Aboveground, aluminum | CBI | — | — | 1971 — second tank |
| BOSTON GAS CO.<br>Lynn, Mass. | 7.85 | 1000 | 290 | 86.4/57.6 | 3 at 28.8 | 12 | Submrgd | Aboveground, 9% nickel | PDM | Air Products & Chemicals, Inc. | MCR | 1972 |
| BRITISH COLUMBIA HYDRO AND POWER AUTHORITY<br>Vancouver, B.C. | 2.5 | 625 | 180 | 150/100 | 3 at 50 | 6 | Submrgd | Aboveground, 9% nickel | Pittsburgh Des Moines Steel | Air Liquide | TEALARC | 1971 |
| BROOKLYN UNION GAS CO.<br>Brooklyn, N.Y. | 5.68 | 625 | 175 | 100 | 2 at 50 | 4 | Direct Fired | Aboveground, 9% nickel | CBI | American Messer | Expander | 1968 |
| BROOKLYN UNION GAS CO.<br>Brooklyn, N.Y. | — | 1000 | 290 | 50 | 2 at 25 | — | Direct Fired | Aboveground, 9% nickel | CBI | — | — | 1971 — second tank |
| | | | | 125 | 2 at 62.5 | — | Submrgd | | | | | |
| | | | | 125 | 2 at 62.5 | — | Submrgd | | | | | 1979 |
| CHATTANOOGA GAS CO.<br>Chattanooga, Tenn. | 10.0 | 1200 | 348 | 90/60 | 3 at 30 | 20 | Direct Fired | Aboveground, 9% nickel | PDM | J. F. Pritchard | PRICO | 1973 |
| CITIZENS GAS & COKE UTILITY<br>Beech Grove, Ind. | 5.0 | 1000 | 290 | 180 | 3 at 60 | 5 | Submrgd | Aboveground, aluminum | PDM | Air Liquide | TEALARC | 1972 |
| COMMONWEALTH NATURAL GAS CO., Tidewater, Va. | 6.0 | 1200 | 348 | 105 | 3 at 35 | 17 | Direct Fired | Aboveground, 9% nickel | PDM | Envirogenics | Cascade | 1972 |
| CONNECTICUT NATURAL GAS CORP., Rocky Hill, Con. | 6.6 | 1200 | 348 | 80/55 | 2 at 25<br>1 at 30 | 24 | Vapor Trsfr<br>Submrgd | Aboveground, 9% nickel | PDM | Airco Cryoplants | Expander/ Nitrogen | 1972 |
| CONSOLIDATED EDISON CO.<br>Astoria, N.Y. | 6.0 | 1000 | 290 | 300/240 | 5 at 60 | 4 | N.A. | Aboveground, 9% nickel | PDM | Airco Cryoplants | Expander/ Nitrogen | 1974 |
| DELMARVA POWER & LT. CO.<br>Wilmington, Del. | 1.71 | 250 | 72.5 | 50 | 2 at 25 | 5 | Direct Fired | Aboveground, aluminum | CBI | Lotepro-Linde AG | Expander/ Nitrogen | 1972 |
| EAST TENNESSEE NATURAL GAS CO.<br>Fordtown, Tenn. | 5.5 | 1200 | 348 | 150 | 2 at 75 | 8 | Direct Fired | Aboveground, aluminum | CBI | CBI | MRL | 1975 |
| ENERGY TERMINAL SERVICES CORP., Staten Island, N.Y. | 30.0 | 6000 | 1800 | 380 | 2 at 60<br>2 at 120 | 8 | Direct Fired | Prestressed concrete | Preload/Walsh | NA | NA | 1982 planned |
| (Conversion of part of terminal capacity to peakshaving. Uses two storage tanks and all of vaporization capacity.) | | | | | | | | | | | | |
| FALL RIVER GAS CO.<br>Fall River, Mass. | 0.5 | 150 | 45 | 10 | 1 | 15 | Direct Fired | Aboveground, 9% nickel | PDM | CVI Corp. | Dual J. T. Cycle | 1970 |
| GAS LIGHT CO. OF COLUMBUS<br>Columbus, Ga. | 1.7 | 500 | 145 | 60 | 2 at 30 | 8 | Indirect Fluid | Aboveground, aluminum | CBI | CBI | Expander | 1974 |
| GAZ METROPOLITAIN, INC.<br>Montreal, Que., Canada | 10.0 | 1000 | 290 | 180 | 3 at 60 | 16 | Submrgd | Aboveground, 9% nickel | Horton (CBI) | Air Liquide | TEALARC | 1969 |
| GAZ METROPOLITAIN, INC.<br>Montreal, Que., Canada | — | 1000 | 290 | — | — | — | — | Aboveground, 9% nickel | Horton (CBI) | — | — | 1972 — second tank |
| INTERMOUNTAIN GAS CO.<br>Boise, Idaho | 4.0 | 600 | 175 | 90/60 | 3 at 30 | 10 | Submrgd | Aboveground, aluminum | PDM | Lotepro-Linde AG | Expander/ Nitrogen | 1974 |
| IOWA-ILLINOIS GAS & ELEC. CO.<br>Bettendorf, Iowa | 2.0 | 500 | 145 | 50 | 2 at 25 | 10 | Uniflux | Aboveground, aluminum | CBI | CBI | MRL | 1972 |
| IOWA POWER & LT. CO.<br>Des Moines, Iowa | 2.0 | 400 | 116 | 30 | 2 at 15 | 13 | Intermed. Fluid | Aboveground, aluminum | CBI | CBI | MRL | 1975 |
| IOWA PUBLIC SERVICE CO.<br>Waterloo, Iowa | 2.5 | 400 | 117 | 30 | 2 at 15 | 26 | Intermed. Fluid | Aboveground, aluminum | PDM | APCO (prime)<br>Air Liquide (liquefaction) | TEALARC | 1978 |
| IOWA PUBLIC SERVICE CO.<br>Waterloo, Iowa | — | 400 | 117 | — | — | — | — | Aboveground, aluminum | CBI | — | — | 1978 — second tank |
| KOKOMO GAS & FUEL CO.<br>Kokomo, Ind. | 1.3 | 400 | 116 | 30/15 | 2 at 15 | 26 | Intermed. Fluid | Aboveground, aluminum | CBI | CBI | Expander | 1973 |
| KOKOMO GAS & FUEL CO.<br>Kokomo, Ind. | 1.25 | — | — | — | — | — | — | (Second liquefaction unit) | | CBI | MRL | 1974 |
| LONG ISLAND LIGHTING CO.<br>Holbrook, N.Y. | 3.0 | 600 | 175 | 200/150 | 4 at 50 | 4 | Submrgd | Aboveground, 9% nickel | PDM | Lotepro-Linde AG | Cascade/ Mixed Refrigerant | 1971 |
| LOWELL GAS CO.<br>Lowell, Mass. | 4.5 | 1000 | 290 | 70/70 | 2 at 30<br>1 at 10 | 16 | Direct Fired | Aboveground, 9% nickel | Graver/ Envirogenics | Envirogenics | Expander | 1969 |
| MEMPHIS LIGHT, GAS & WATER DIV., Memphis, Tenn. | 5.0 | 1000 | 290 | 201 | 3 at 67 | 5 | Submrgd | Aboveground, 9% nickel | CBI | Air Liquide | Cascade | 1967 |
| METRO. UTILITIES DISTRICT<br>Omaha, Nebr. | 6.0 | 1000 | 290 | 60/30 | 2 at 30 | 33 | Submrgd | Aboveground, 9% nickel | CBI | Lotepro-Linde AG | Expander/ Nitrogen | 1975 |
| MINNESOTA GAS CO.<br>Burnsville, Minn. | 5.0 | 1000 | 290 | 80 | 2 at 40 | 12 | Intermed. Fluid | Aboveground, 9% nickel | CBI | CBI | MRL | 1978 |
| NORTH CAROLINA NATURAL GAS CORP.<br>Johnson County, N. Car. | 3.5 | 735 | 212 | 60 | 1 | | Submrgd | Aboveground, 9% nickel | — | — | — | 1984 — Planned |
| NORTHERN IND. PUBLIC SERVICE CO.<br>La Porte, Ind. | 10.0 | 2000 | 580 | 300/200 | 3 at 100 | 10 | Direct Fired | Aboveground, 9% nickel | CBI | J. F. Pritchard | PRICO | 1974 |
| NORTHERN IND. PUBLIC SERVICE CO.<br>La Porte, Ind. | 10.0 | 2000 | 580 | 300/200 | 3 at 100 | 10 | Submrgd | Aboveground | CBI | Lotepro | Mixed Refrigerant | 1981 |
| NORTHERN & CENTRAL GAS CO.<br>Hagar, Ontario | 2.5 | 625 | 180 | 85 | 3 at 42.5 | 7 | Submrgd | Aboveground, 9% nickel | Horton (CBI) | Air Liquide | TEALARC | 1968 |
| NORTHERN & CENTRAL GAS CO.<br>Hagar, Ontario | — | — | — | — | 1 at 42.5 | — | Submrgd | Aboveground, 9% nickel | Horton (CBI) | Lotepro Engr. | — | 1977 |
| NORTHERN NATURAL GAS CO.<br>Wrenshall, Minn. | 10.0 | 2185 | 630 | 200 | 2 at 100 | 10 | Submrgd | Aboveground, 9% nickel | PDM | SD Plants | TEALARC | 1975 |
| NORTHERN NATURAL GAS CO.<br>Ventura, Iowa | 14.5 | 2185 | 630 | 300 | 3 at 100 | 7 | Submrgd | Aboveground, 9% nickel | PDM | NNG | PRICO | 1978 |
| NORTHERN STATES POWER CO.<br>Eau Claire, Wisc. | 2.0 | 270 | 78 | 24/24 | 2 at 12<br>3 at 36 | 11 | Direct Fired | Aboveground, aluminum | CBI | CBI | Expander | 1969 |
| NORTHERN STATES POWER CO.<br>Wescott, Minn. | 10.0 | 2130 | 588<br>(2 x 290)<br>(1 x 32) | 138 | 2 at 24 | 28 | Direct Fired | Aboveground, 9% nickel | CBI | CBI | MRL | 1972, 1975 |
| NORTHWEST NATURAL GAS CO.<br>Portland, Ore. | 2.5 | 625 | 175 | 200 | 2 at 60<br>1 at 20<br>2 at 30 | 10 | Direct Fired<br>Submrgd | Aboveground, aluminum | CBI | CBI | Expander | 1969 |
| NORTHWEST NATURAL GAS CO.<br>Newport, Ore. | 5.0 | 1200 | 348 | 100/100 | 2 at 50 | 12 | Submrgd | Aboveground, 9% nickel | CBI | CBI | MRL/ CRYEX | 1977 |
| NORTHWEST PIPELINE CORP.<br>Plymouth, Wash. | 6.0 | 1200 | 348 | 225 | 3 at 75 | 8 | Submrgd | Aboveground, aluminum | PDM | Air Liquide | TEALARC | 1975 |
| NORTHWEST PIPELINE CORP.<br>Plymouth, Wash. | 6.0 | 1200 | 348 | 75 | 1 at 75 | 16 | Submrgd | Aboveground, 9% nickel | PDM | Air Liquide | TEALARC | 1979 |
| PEOPLES GAS, LIGHT & COKE<br>Fisher, Ill. | 10.6 | 2000 | 580<br>(2 x 290) | 300/200 | 3 at 67<br>1 at 100 | 10 | Direct Fired | Aboveground, aluminum | CBI | CBI | Expander | 1972 |
| PHILADELPHIA ELECTRIC CO.<br>West Conshohocken, Pa. | 6.6 | 1200 | 348 | 310/186 | 5 at 62 | 4 | Submrgd | Aboveground, 9% nickel | CBI | Airco Cryoplants | Expander/ Nitrogen | 1972 |
| PHILADELPHIA GAS WORKS<br>Philadelphia, Pa. | 25.0 | 4000 | 1166<br>(2 x 583) | 500/400 | 5 at 100 | 10 | Intermed. Fluid | Aboveground, Prestressed concrete | Preload | J. F. Pritchard | Cascade | 1969 — Plant operable; 1974 on tanks |
| PIEDMONT NATURAL GAS CO.<br>Charlotte, N. Car. | 5.0 | 1000 | 290 | 150 | 3 at 50 | 7 | Direct Fired | Aboveground, 9% nickel | CBI | CBI | MRL | 1973 |

## Cont'd U.S. and Canadian LNG Peakshaving Facilities

| Company and Plant Site | Liquefaction Plant Capacity, MMcfd/day | Storage Capacity, MMcf | Storage Capacity, Mbbl | Total Design Capacity | Regasification—MMcfd Runs | No. of Days | Type | Type of Storage Container | Storage Contractor | Liquefaction Plant Contractor | Type of Cycle | Year of Operation |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PUBLIC SERVICE CO. OF NORTH CAROLINA, Cary, N. Car. | 3.0 | 1000 | 290 | 100 | 2 at 50 | 6 | Inter. Fluid | Aboveground, 9% nickel | CBI | CBI | MRL | 1976 |
| ROANOKE GAS CO. Roanoke, Va. | 1.0 | 200 | 58.5 | 20 | 2 at 10 | 13 | Intermed. Fluid | Aboveground, aluminum | CBI | CBI | MRL | 1972 |
| SAN DIEGO GAS & ELECTRIC CO. Chula Vista, Calif. No. 1 Plant | 2.0 | 625 | 175 | 170/60 | 2 at 80 | 10 | Submrgd | Aboveground, 9% nickel | CBI | American Messer | Expander | 1965 |
| SAN DIEGO GAS & ELECTRIC CO. Chula Vista, Calif. No. 2 Plant | 7.0 | 1200 | 348 | 180/125 | 3 at 60 | 10 | Submrgd | Aboveground, 9% nickel | CBI | Airco Cryoplants | Expander/ Nitrogen | 1970 |
| SOUTH CAROLINA LNG CO. Bushey Park, So. Car. | 6.0 | 1000 | 290<br>(2 x 145) | 60 | 2 at 30 | 17 | Intermed. Fluid | Aboveground, aluminum | PDM | APCO (prime)<br>Air Liquide | TEALARC | 1976 |
| SOUTHERN CONNECTICUT GAS CO., Milford, Conn. | 6.6 | 1200 | 348 | 90 | 2 at 30<br>1 at 30 | 14 | Vapor Trsfr<br>Submrgd | Aboveground, 9% nickel | PDM | Airco Cryoplants | Expander/ Nitrogen | 1972 |
| SOUTHWEST GAS CORP. Lovelock, Nev. | 5.0 | 1000 | 290 | 105/70 | 3 at 35 | 10 | Submrgd | Aboveground, 9% nickel | CBI | CBI | MRL | 1982 — U.C. |
| TENNESSEE NATURAL GAS LINES, INC., Nashville, Tenn. | 5.0 | 1000 | 290 | 150/100 | 3 at 50 | 10 | Direct Fired | Aboveground, aluminum | CBI | CBI | MRL | 1973 |
| TEXAS EASTERN TRANS. CO. Staten Island, N.Y. | 7.65 | 2000 | 600 | 292/195 | 3 at 97.5 | 10 | Direct Fired | Aboveground, 9% nickel both walls | N.A. | Texas Eastern Cryogenics | TEALARC | 1970; storage destroyed 1973; new double-wall tank — planned on same foundation |
| TRANSCONTINENTAL GAS, P.L. CORP., Hackensack, N.J. | 7.0 | 1000 | 290 | 200/200 | 2 at 100 | 5 | Intermed. Fluid | Aboveground, aluminum | CBI | J. F. Pritchard | Cascade | 1965; 1970 on new tank |
| TRANSCONTINENTAL GAS P.L. CORP., Hackensack, N.J. | — | 1000 | 290 | 200/200 | 2 at 100 | — | Uniflux | Aboveground, 9% nickel | PDM | — | — | 1974 — second tank |
| UGI CORP. Temple, Pa. | 2.0 | 250 | 73 | 30/30 | 3 at 10 | 8 | Submrgd | Aboveground, 9% nickel | PDM | Airco Cryoplants | Expander | 1973 (1972 as satellite) |
| UTILITIES BOARD Trussville, Ala. | 5.0 | 400 | 116 | 20 | 2 at 10 | — | Intermed. Fluid | Aboveground, Aluminum | CBI | CBI | MRL/ CRYEX | 1976 |
| WISCONSIN NATURAL GAS CO. Oak Creek, Wisc. | 0.75 | 250 | 72 | 50/25 | 2 at 25 | 10 | Intermed. Fluid | Aboveground, aluminum | CBI | CBI | Cascade | 1965 |

## International LNG Peakshaving Facilities

| Company and Plant Site | Liquefaction Plant Capacity, MMcfd/day | Storage Capacity, MMcf | Storage Capacity, Mbbl | Total Design Capacity | Regasification—MMcfd Runs | No. of Days | Type | Type of Storage Container | Storage Contractor | Liquefaction Plant Contractor | Type of Cycle | Year of Operation |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BRITISH GAS CORP. Avonmouth, Avon | 10.0 | 1000 | 290 | 270 | 3 at 90 | 4 | Submrgd | Aboveground, aluminum | Whessoe, Ltd. | Cryoplants, Ltd. | MCR | 1978 — Plant<br>1979 — Tank |
| BRITISH GAS CORP. Avonmouth, Avon | — | 1000 | 290 | 180 | 2 at 90 | — | Submrgd | Aboveground, 9% nickel | Motherwell Bridge Engrg. Ltd. | — | — | 1979 — Second tank |
| BRITISH GAS CORP. Avonmouth, Avon | — | 1000 | 290 | 90 | 1 | — | Submrgd | Aboveground, 9% nickel | N.A. | — | — | 1983 — Planned |
| BRITISH GAS CORP. Glenmavis, Scotland | 5.0 | 1000 | 290 | 240 | 4 at 60 | 4 | Submrgd | Aboveground, 9% nickel | Motherwell Bridge Engrg. Ltd. | Cryoplants, Ltd. | MCR | 1974 — (North Sea Gas) |
| BRITISH GAS CORP. Glenmavis, Scotland (2nd plant) | 10.0 | 1000 | 290 | 120 | 2 at 60 | 17 | Submrgd | Aboveground, 9% nickel | Motherwell Bridge Engrg. Ltd. | Cryoplants, Ltd. | MRC | 1972 |
| BRITISH GAS CORP. Partington, Cheshire, England | 10.0 | 2000 | 580<br>(2 x 290) | 450 | 5 at 90 | 4 | Submrgd | Aboveground, 9% nickel | Wm. Neill & Son (St. Helens) Ltd. (PDM Lic.) | Cryoplants, Ltd. | MRC | 1973 |
| BRITISH GAS CORP. Partington, Cheshire, England (2nd plant) | 10.0 | 2000 | 580<br>(2 x 290) | 270 | 3 at 90 | 2 | Submrgd | Aboveground, aluminum | Whessoe, Ltd. | Cryoplants, Ltd. | MRC | 1974 on tank<br>1975 on plant |
| BRITISH GAS CORP. Isle of Grain, Kent | 10.0 | 2000 | 580<br>(2 x 290) | 390 | 3 x 130 | 5 | Direct Fired | Aboveground, 9% nickel | Motherwell Bridge Engrg Ltd. | Petrocarbon Development Ltd. | Open Expander | 1981 |
| BRITISH GAS CORP. Isle of Grain, Kent | 10.0 | 2000 | 580<br>(2 x 290) | 390 | 3 x 130 | 5 | Direct Fired | Aboveground, 9% nickel | Whessoe, Ltd. | Petrocarbon Development, Ltd. | Nitrogen Expander | 1982 |
| BRITISH GAS CORP. Dynevor Arms, S. Wales | 10.0 | 1000 | 290 | 180 | 2 x 90 | 5 | N.A. | Aboveground | N.A. | Snamprogetti | TEALARC | 1983 — U.C. |
| BRITISH GAS CORP. Canvey Island, England | 10.3 | — | — | (Production plant only)<br>(Reliquefaction) | | | | — | — | Air Products, Ltd. | APCI-MCR | 1972 |
| N.V. NEDERLANDSE GASUNIE Maasvlakte, The Netherlands | 12.4 | 2700 | 860<br>(2 x 430) | 930 | 8 at 90<br>3 at 70 | 4 | Submrgd | Aboveground, 9% nickel | Nederhorst Steel (PDM Lic.) | Linde A.G. | Expander/ Nitrogen | 1977 |
| DISTRIGAZ, S.A. Zeebrugge, Belgium | 12.3 | 2480 | 716<br>(2 x 358) | 391 | 5 | 6 | Submrgd | Aboveground, 9% nickel | Boelwerf/ CMP/CBI | Linde A.G. | Nitrogen/ Expander | 1978 |
| STUTTGART CITY UTILITIES Stuttgart, W. Germany | 3.4 | 665 | 193 | 88.9 | 3 | 10 | Submrgd | Aboveground, 9% nickel | Linde A.G. | Linde A.G. | Open Mixed Refrigerant | 1971 — Peakshaving plant |
| THYSSEN GAS GmbH Duisburg, Hamborn, W. Germany | 2.1 | 560 | 145 | 135/90 | 3 at 45 | 5.5 | Submrgd | Aboveground, 9% nickel | CBI | CBI | MRL | 1976 |
| GAS & FUEL CORP. OF VICTORIA Dandenong, Victoria, Australia | 5.0 | 500 | 145 | 125 | 2 at 62.5 | 4 | Submrgd | Aboveground, 9% nickel | CBI Pty. Ltd. | Cryoplants, Ltd. | MRC | 1979 |

## EUROPEAN SATELLITE PEAKSHAVING FACILITIES

| Company | Plant Location | LNG Source | Storage Volume MMcf | Storage Volume Mbbl | Sendout Capacity MMcf/day | Type of Storage Container | Storage Contractor | Systems Contractor | Year of Operation |
|---|---|---|---|---|---|---|---|---|---|
| British Gas Corp. | Ambergate, Derbyshire England | Imported LNG From Canvey Island | 265 | 72 | 64 | Field Erected aluminum | Whessoe, Ltd. | Whessoe, Ltd. (Helium Expander Reliquefaction) | 1969 |
| British Gas Corp. | Amlwch, Anglesey, Wales, U.K. | British Gas Corp. Glenmavis, Scotland | 0.399 | 0.0117 | 0.360 | Shop fabricated, 9% nickel | Air Products, Ltd. | British Gas Corp. Wales Region | 1975 |
| British Gas Corp. | Stranraer, Wigtownshire, Scotland, U.K. | British Gas Corp. Glenmavis, Scotland | 3.535 | 1.037 | 1.200 | Shop fabricated, stainless steel | Cryoplants, Ltd. | British Gas Corp. Scottish Region | 1973 |
| British Gas Corp. | Oban, Argyll, Scotland, U.K. | British Gas Corp. Glenmavis, Scotland | 3.434 | 1.007 | 0.480 | Shop fabricated, 2 tanks, stainless steel; 1 tank, 9% nickel | Clark Chapman, Ltd.<br>Air Products, Ltd. | British Gas Corp. Scottish Region | 1972 |
| British Gas Corp. | Toleway, Bute, Scotland, U.K. | British Gas Corp. Glenmavis, Scotland | 4.545 | 1.332 | 1.200 | Shop fabricated, 9% nickel | Air Products, Ltd. | British Gas Corp., Scottish Region | 1975 |
| British Gas Corp. | Dunoon, Argyll, Scotland, U.K. | British Gas Corp. Glenmavis, Scotland | 6.060 | 1.777 | 1.920 | Shop fabricated, 9% nickel | Air Products, Ltd. | British Gas Corp., Scottish Region | 1973 |
| British Gas Corp. | Dingwall Ross, Scotland, U.K. | British Gas Corp. Glenmavis, Scotland | 1.768 | 0.518 | 0.360 | Shop fabricated, stainless steel | Cryoplants, Ltd. | British Gas Corp., Scottish Region | 1974 |
| British Gas Corp. | Campbeltown, Argyll, Scotland, U.K. | British Gas Corp. Glenmavis, Scotland | 4.545 | 1.332 | 0.900 | Shop fabricated, 2 tanks, 9% nickel; 1 tank, stainless steel | Air Products, Ltd.<br>Cryoplants, Ltd. | British Gas Corp., Scottish Region | 1974 |
| British Gas Corp. | Moffat, Dumfriesshire, Scotland, U.K. | British Gas Corp. Glenmavis, Scotland | 1.765 | 1.763 | 0.350 | Shop fabricated, stainless steel | Cryoplants, Ltd. | British Gas Corp., Scottish Region | 1975 |

## Cont'd EUROPEAN SATELLITE PEAKSHAVING FACILITIES

| Company | Plant Location | LNG Source | Storage Volume MMcf | Storage Volume Mbbl | Sendout Capacity MMcf/day | Type of Storage Container | Storage Contractor | Systems Contractor | Year of Operation |
|---|---|---|---|---|---|---|---|---|---|
| Gaz de France | Nantes, Loire-Atlantique France | Gaz de France LeHavre, France | 50.1 | 15.7 | 17.0 | Field erected, 1 tank, 9% nickel, 3145 bbl; 1 tank, concrete/invar, 12,579 bbl | Creusot — Loire Gaz Transport | Gaz de France | 1966 |
| Gaz de France | Granville, Manche, France | Gaz de France Le Havre, France | 11.1 | 3.5 | 35.3 | Field erected, 9% nickel | Bignier-Smidt-Laurent | Gaz de France | 1976 |
| Erdgas Sudbayern GmbH | Geretsried, W. Germany | Technische Werke der Stadt Stuttgart, W. Germany | 2.1 | 0.629 | 1.7 | Shop fabricated | Linde AG | Linde AG | 1974 |
| Technische Werke der Stadt Stuttgart | (Truck) | Technische Werke der Stadt Stuttgart, W. Germany | 0.880 | 0.258 | 0.848 | Truck transport | Linde AG and Aurepa | Technische Werke der Stadt Stuttgart | 1976 |
| Thyssengas GmbH | (Truck) | Thyssengas Duisberg-Hamborn W. Germany | 0.645 | 0.188 | 0.848 | Truck transport | Aurepa | Thyssengas | 1977 |
| Gas Figueras S.A. | Gerona, Spain | ENAGAS Barcelona, Spain | 4.385 | 1.26 | 0.058 | Shop fabricated, stainless steel | Mecanica de la Pena | Erhan | 1971 |
| Gas Costa Brava S.A. | Gerona, Spain | ENAGAS Barcelona, Spain | 0.877 | 0.252 | 0.252 | Shop fabricated, stainless steel | Maquinista Terrestrey Maritima | British Oxygen | 1977 |
| Gas Tarraconense S.A. | Tarragona, Spain | ENAGAS Barcelona, Spain | 1.315 | 0.378 | 0.112 | Shop fabricated, stainless steel | Air Liquide Spain | Air Liquide Spain | 1977 |
| Sugranes Gres Catalan S.A. | Barcelona, Spain | ENAGAS Barcelona, Spain | 5.262 | 1.512 | 0.196 | Shop fabricated, stainless steel | Air Liquide Spain | Air Liquide Spain | 1973 |
| Colonia Guell S.A. | Gerona, Spain | ENAGAS Barcelona, Spain | 1.754 | 0.504 | 0.037 | Shop fabricated, stainless steel | Maquinista Terrestrey Maritima | British Oxygen | 1977 |
| Gas Ceira, S.A. | Gerona, Spain | ENAGAS Barcelona, Spain | 1.315 | 0.378 | N.A. | Shop fabricated, stainless steel | N.A. | N.A. | 1977 |
| Termica Cubelles | Tarragona, Spain | ENAGAS Barcelona, Spain | 0.438 | 0.126 | 0.009 | Shop fabricated, stainless steel | Air Liquide Espanola | Air Liquide Espanola | 1978 |

NA = Not Available

## LNG Satellite Peakshaving Facilities Small Capacity Plants — Shop Builtup Components

| Company | Plant Location | LNG Source | Storage Volume MMcf | Storage Volume Mbbl | Sendout Capacity MMcf/day | Type of Storage Container | Storage Contractor | Systems Contractor | Year of Operation |
|---|---|---|---|---|---|---|---|---|---|
| Bay State Gas Co. | Marshfield, Mass. | Bay State, Distrigas | 9.0 | 110 | 10.0 | Shop builtup cylinders | Process Eng. | Gas, Inc. | 1971 |
| City of Brownsville Gas Dept. | Brownsville, Tenn. | Memphis LG&W | 0.5 | 6 | 10.0 | Trailer shuttle | Ryan Industries | City of B'ville Gas Dept. | 1970 |
| Cape Cod Gas Co. | South Yarmouth, Mass. | Lowell Gas Co. | 5.2 | 63.5 | 0.6 | Shop builtup cylinder | Process Eng. | Process Eng. | 1970 |
| Cape Cod Gas Co. | Wareham, Mass. | Lowell Gas Co. | 9.0 | 110 | 2.9 | Shop builtup cylinder | Process Eng. | Gas, Inc. | 1974, 1978 |
| Concord Natural Gas Corp. | Concord, N.H. | Bay State Gas Co. | 4.5 | 55 | 4.8 | Shop builtup cylinders | Process Eng. | Gas, Inc. | 1974 |
| Consumers Gas Co. | Arnprior, Ont., Can. | Gaz Metropolitan | 4.5 | 55 | 4.8 | Shop builtup cylinders | Process Eng. | Gas, Inc. | 1978 |
| DeKalb-Cherokee Counties Gas District | Fort Payne, Ala. | Chattanooga Gas Co. | 4.5 | 55 | 2.2 | Shop builtup cylinders | LOX Equip. | Ladd Eng. Assoc. | 1972 |
| Elizabethtown Gas Co. | Hackettstown, N.J. | Transco | 1.7 | 21 | 5.8 | Shop builtup cylinder | Process Eng. | PDM | 1971 |
| Fitchburg Gas & Electric Light | Westminster, Mass. | Lowell Gas Co. | 4.5 | 55 | 5.0 | Shop builtup cylinders | Process Eng. | Gas, Inc. | 1974 |
| Gas Service Inc. | Nashua, N.H. | New England LNG | 4.5 | 55 | 7.2 | Shop builtup cylinders | Process Eng. | Gas, Inc. | 1973 |
| Holyoke Gas Department | Holyoke, Mass. | Lowell Gas Co. | 18.0 | 220 | 12.0 | Shop builtup cylinders | Process Eng. | Gas, Inc. | 1971 |
| Lawrence Gas Co. | Lawrence, Mass. | Lowell Gas Co. | 12.3 | 150 | 18.0 | Shop builtup cylinder | H. L. Johnson | Gas, Inc. and Smith & Norrington | 1969, 1972 |
| Lowell Gas Co. | Wilmington, Mass. | Lowell Gas Co. | 2.5 | 30 | 12.0 | Shop builtup cylinders | H. L. Johnson | Gas, Inc. | 1971 |
| Lowell Gas Co. | Westford, Mass. | Lowell Gas Co. | 4.5 | 55 | 6.0 | Shop builtup cylinder | Process Eng. | Gas, Inc. | 1972, 1974 |
| Manchester Gas Co. | Manchester, N.H. | New England LNG Co. | 4.5 | 55 | 6.0 | Shop builtup cylinders | Process Eng. | Process Eng. | 1975 |
| Middleboro Gas & Electric Dept. | Middleboro, Mass. | Lowell Gas Co. | 2.5 | 30 | 5.0 | Shop builtup cylinder | Process Eng. | Gas, Inc. | 1970 |
| Hartford Elec. Lt. Co. | Torrington, Conn. | Distrigas & New England LNG Co. | 4.5 | 55 | 3.0 | Shop builtup cylinder | Ryan Industries | N. E. Utilities | 1972 |
| Hartford Elec. Lt. Co | Stamford, Conn. | Distrigas & New England LNG Co. | 4.5 | 55 | 4.8 | Shop builtup cylinders | Ryan Industries | N. E. Utilities | 1972 |
| Hartford Elec. Lt. Co. | Danbury, Conn. | Distrigas & New England LNG Co. | 9.0 | 110 | 3.6 | Shop builtup cylinders | Ryan Industries | N. E. Utilities | 1972 |
| Connecticut Lt. & Power Co. | Montville, Conn. | Distrigas & New England LNG Co. | 4.5 | 55 | 2.2 | Shop builtup cylinders | Process Eng. | Gas, Inc. | 1972 |
| Connecticut Lt. & Power Co. | Waterbury, Conn. | Distrigas & New England LNG Co. | 12.4 | 165 | 7.2 | Shop builtup cylinders | Ryan Industries | N. E. Utilities | 1972 |
| Connecticut Lt. & Power Co. | Norwalk, Conn. | Distrigas & New England LNG Co. | 4.5 | 55 | 2.4 | Shop builtup cylinders | Ryan Industries | Conn L&P | 1975 |
| Northern Utilities Inc. | Lewiston, Me. | New England LNG Co. | 12.4 | 165 | 7.2 | Shop builtup cylinders | Process Eng. | Applied Engineering; Gas, Inc. | 1971, 1975, 1977 |
| City of Norwich (Conn.) Dept. of Public Utilities | Norwich, Conn. | New England LNG Co. | 4.5 | 55 | 7.2 | Shop builtup cylinders | Process Eng. | Gas, Inc. | 1972 |
| Piedmont Natural Gas Company | Lenoir, N.C. | American LNG Corp. | 4.5 | 55 | 2.2 | Shop builtup cylinders | Process Eng. | Process Eng. | 1971 |
| Savannah Public Utility Dept. | Savannah, Tenn. | Chattanooga Gas Co. | 0.85 | 11 | 1.5 | Trailer shuttle | Process Eng. | Process Eng. | 1973 |
| United Cities Gas Co. | Murfreesboro, Tenn. | Chattanooga Gas Co. | 4.5 | 55 | 0.2 | Shop builtup cylinders | Process Eng. | Process Eng. | 1973 |
| UGI Corporation | Hazleton, Pa. (portable) | UGI Corp. Temple, Pa. | 0.85 | 11 | 2.0 | Trailer shuttle | Process Eng. | Cosmodyne | 1974 |
| Westfield Gas Dept. | Westfield, Mass. | Lowell Gas Co. | 9.0 | 110 | 12.0 | Shop builtup cylinders | Process Eng. | Gas, Inc. | 1971, 1974 |
| Wisconsin Gas Co. | Rice Lake, Wis. | Northern States Power | 18.0 | 220 | 7.2 | Shop builtup cylinders | Process Eng. | Gas, Inc. | 1974 |
| Middle Tennessee Natural Gas Authority | Smithville, Tenn. | Memphis LG&W Div. | 1.8 | 22 | 0.08 | Trailer shuttle | American LNG Co. | American LNG Co. | 1975 |

## LNG Satellite Facilities in Japan

| Company | Plant Location | LNG Source | Storage Volume MMcf | Storage Volume MBbl | Sendout Capacity MMcf/day | Type of Storage Container | Storage Contractor | Systems Contractor | Year of Operation |
|---|---|---|---|---|---|---|---|---|---|
| Tokyo Gas Co. | Hitachi, Ibaragi | Tokyo Gas Co. Negishi/Sodegaura | 31.3 | 9.20<br>(1 x 8.82)<br>(1 x 0.38) | 133 2 x 22<br>1 x 80 | Field erected<br>Shop fabricated | Hitachi Nippon Oxygen | Tokyo Gas Company | 1970 |
| Washinomiya Gas Co. | Washinomiya, Saitama | Tokyo Gas Co. Negishi/Sodegaura | 0.77 | 0.226<br>(2 x 0.113) | 33 3 x 11 | Shop fabricated | Tokyo Oxygen | Tokyo Gas Company | 1971 |
| Syoei Gas Co. | Higashimatsuyama Saitama | Tokyo Gas Co. Negishi/Sodegaura | 0.43 | 0.126<br>(2 x 0.063) | 10 2 x 5 | Shop fabricated | Nippon Oxygen | Tokyo Gas Company | 1975 |
| Miho Gas Co. | Miho, Ibaragi | Tokyo Gas Co. Negishi/Sodegaura | 1.29 | 0.378<br>(3 x 0.126) | 66 3 x 22 | Shop fabricated | Nippon Oxygen | Tokyo Gas Company | 1977 |
| Tokyo Gas Co. | Kofu, Yumanashi | Tokyo Gas Co. Negishi | 1.73 | 0.503 | N.A. | Shop fabricated | Teikoku Oxygen; Nissan Kogyo | Tokyo Gas Company | 1981 |

## LNG Satellite Peakshaving Facilities Large Capacity Plants — Field Constructed K.D. Components

| Company | Plant Location | LNG Source | Storage Volume MMcf | Storage Volume MBbl | Sendout Capacity MMcf/day | Type of Storage Container | Storage Contractor | Systems Contractor | Year of Operation |
|---|---|---|---|---|---|---|---|---|---|
| Atlanta Gas Light Co. | Macon, Ga. | Southern Energy | 1500 | 450.0 | 150.0 | Aboveground, aluminum | CBI | Applied Engineering | 1977 |
| Austell Gas Dept. | Austell, Ga. | American LNG Corp. | 80 | 23.3 | 20.0 | Aboveground, aluminum sphere | CBI | CBI | 1972 |
| Bay State Gas Co. | Easton, Mass. | Distrigas | 800 | 225.0 | 35.0 | Aboveground, aluminum | CBI | CBI | 1972 |
| Boston Gas Co. | Salem, Mass. | Boston Gas | 1000 | 290.0 | 30.0 | Aboveground, 9% nickel | PDM | PDM | 1972 |
| Cape Cod Gas Co. | South Yarmouth, Mass. | Lowell Gas Co. | 175 | 51.5 | 20.0 | Prestressed concrete w/liner | Walsh Construction | Gas, Inc. | 1971 |
| Chicago Bridge & Iron Co. | Cordova, Ala. | American LNG Corp. | 45 | 13.0 | 3.5 | Aboveground, aluminum sphere | CBI | CBI | 1975 |
| Elizabethtown Gas Co. | Elizabeth, N.J. | Transco | 150 | 45.0 | 30.0 | Aboveground, aluminum | PDM | PDM | 1971 |
| Fort Hill Natural Gas Authority | Fort Hill, S.C. | American LNG Corp. | 35 | 10.0 | 12.0 | Aboveground, aluminum sphere | CBI | CBI | 1970 |
| Haverhill Gas Co. | Haverhill, Mass. | Distrigas | 400 | 114.0 | 24.0 | Aboveground, aluminum | CBI | CBI | 1972 |
| Lynchburg Gas Co. | Lynchburg, Va. | Roanoke Gas Co. | 42 | 12.0 | 7.2 | Aboveground, aluminum sphere | Graver | Gas, Inc. | 1976 |
| New Bedford Gas & Edison Light Co. | Acushnet, Mass. | Hopkinton LNG Corp. | .200 | 58.0 | 30.0 | Aboveground, 9% nickel | PDM | Air Products | 1971 |
| New Bedford Gas & Edison Light Co. | Acushnet, Mass. | Hopkinton LNG Corp. | 300 | 87.0 | — | Aboveground, aluminum | CBI | — | 1973 (2nd tank) |
| New Jersey Natural Gas Co. | Stafford Township, N.J. | Distrigas | 100 | 28.5 | 20.0 | Aboveground, aluminum | CBI | CBI | 1971 |
| New Jersey Natural Gas Co. | Howell Township, N.J. | Distrigas | 400 | 117.0 | 60.0 | Aboveground, aluminum | PDM | PDM | 1974 |
| Northern States Power Co. | LaCrosse, Wis. | NSP | 130 | 37.0 | 12.0 | Aboveground, aluminum | CBI | CBI | 1969 |
| Philadelphia Gas Works | Philadelphia, Pa. | PGW | 250 | 73.0 | 88.8 | Aboveground, 9% nickel | PDM | Envirogenics | 1971 |
| Providence Gas Co. | Exeter, R.I. | Distrigas | 198 | 55.0 | 24.0 | Aboveground, aluminum | Graver/ Envirogenics | Envirogenics | 1972 |
| Public Service Gas & Electric Co. | Burlington Township, N.J. | Distrigas | 350 | 100.0 | 75.0 | In-ground, aluminum | CBI | Envirogenics | 1972 |
| Springfield Gas Utility | Springfield, Tenn. | Various | 20 | 5.0 | 4.8 | Aboveground, aluminum sphere | PDM | PDM | 1974 |
| South Jersey Gas Co. | McKee City, N.J. | Distrigas | 400 | 116.0 | 60.0 | Aboveground, aluminum | CBI | CBI | 1972 |
| Valley Gas Co. | Cumberland, R.I. | New England LNG Co. | 87 | 25.0 | 12.5 | Prestressed concrete w/liner | LNG Co. | Gas, Inc. | 1971 |

## U.S. Remote Supply Projects

| Company | Plant Location | Origin of Liquid | Site Storage, M gal | Site Vaporization Mcf/hr |
|---|---|---|---|---|
| San Diego Gas & Electric Co. | Borrego Springs, Calif. | Peakshaving facility at Chula Vista, Calif. | 7.75 | 9 |
| San Diego Gas & Electric Co. | Alpine Village, Calif. | Peakshaving facility at Chula Vista, Calif. | 25 | 30 |
| San Diego Gas & Electric Co. | Camp Pendleton, Calif. | Peakshaving facility at Chula Vista, Calif. | 50 | 90 |

## International Baseload LNG Liquefaction Facilities

| Company and Plant Site | Liquefaction Plant Capacity, MMcf/day | Storage Capacity, MMcf | Storage Capacity, MBbl | Type of Storage Container | Storage Contractor | Liquefaction Plant Contractor | Type of Cycle | Year of Operation |
|---|---|---|---|---|---|---|---|---|
| ARCTIC PILOT PROJECT Bridport Inlet, Melville Island, Canada | 275 (Barge-mounted) | N.A. | 1257 | N.A. | N.A. | N.A. | Precooled TEALARC | 1985 |
| CAMEL (GL 4-Z) Arzew, Algeria | 200.0 | 1840 total | 210 (3 x 70)<br>310 | Aboveground, (2-aluminum, 1-9% nickel)<br>Frozen hole | CBI lic.<br>Pritchard | TECHNIP<br>Pritchard | Cascade | 1963 et seq. LNG for export to England, France |
| SONATRACH — (GL 1-Z) Arzew, Algeria | 1100.0 | 7000 | 1890 (3 x 630 tanks) | Aboveground, 9% nickel | Toyo Kanetsu, K.K., (PDM Lic.) | Bechtel Corp. & Chemico | APCI-MCR | 1978 |
| SONATRACH — (GL 2-Z) Arzew, Algeria | 1000 | 6000 (3 x 800) | 1800 | Aboveground, 9% nickel | Toyo Kanetsu K.K., (PDM Lic.) | Pullman Kellogg | APCI-MCR | 1982 |
| SONATRACH — (GL 1-K) Skikda, Algeria | 430.0 (3 trains) | 2500 | 700 (2 x 350) | Aboveground, 9% nickel | CMP/CBI | TECHNIP | TEALARC | 1972 |
| SONATRACH — (GL 2-K) Skikda, Algeria | 170.0 (1 train) | 1250 | 350 | Aboveground, 9% nickel | CBI | Pullman-Kellogg | PRICO | 1981 |
| SONATRACH — (GL 3-K) Skikda, Algeria | 350.0 (2 trains) | 3500 | [illegible] (2 x 440) | Aboveground, 9% nickel | CBI/Whessoe | Pullman-Kellogg | PRICO | 1982 |
| SIRTE OIL CO. Marsa el Brega, Libya | 385.0 | 2100 | 630 (2 x 315) | Aboveground, 9% nickel | CBI | Esso R&E-Bechtel — SNAM Progetti | APCI-MCR | 1970 |
| BRUNEI LNG Lumut, Bruneí, Borneo | 750.0 | 4050 | 1131 (3 at 377) | Aboveground, 9% nickel | Toyo Kanetsu K.K., (PDM Lic.) | Japan Gasoline Co. — UOP | APCI-MCR | 1973 |
| ABU DHABI GAS LIQUEFACTION CO. LTD., Das Island, Abu Dhabi | 350.0 | 6600 | 1920 (2 x 960) | Aboveground, 9% nickel | I.H.I. | Bechtel-Chiyoda | APCI-MCR | 1977 |
| ABU DHABI GAS LIQUEFACTION CO. LTD., Das Island, Abu Dhabi | | 5033 | 1510 (3 x 503) | Composite | CBI | — | — | 1985 — U.C. (Replacement for existing storage) |
| PHILLIPS-MARATHON Kenai, Alaska | 185.0 | 2300 | 675 (3 x 225) | Aboveground, aluminum | CBI | Phillips-Bechtel | Cascade | 1969 |
| PERTAMINA/MOBIL Arun, N. Sumatra, Indonesia | 1200 | 8350 | 3200 (4 x 800) | Aboveground, 9% nickel | Toyo Kanetsu K.K., (PDM Lic.) | Bechtel, Inc. | APCI-MCR | 1978 |
| PERTAMINA-MOBIL Arun, N. Sumatra, Indonesia | 550 | — | — | | | Chiyoda | APCI-MCR | 1984 — U.C. |
| PERTAMINA/HUFFCO Badak, E. Kalimantan, Indonesia | 550 | 8330 | 2400 (4 x 600) | Aboveground, 9% nickel | Hitachi Zosen — CBI | Bechtel, Inc. | APCI-MCR | 1977 |
| PERTAMINA/HUFFCO Badak, E. Kalimantan, Indonesia (expansion) | 530 | 2777 | 800 | Aboveground, 9% nickel | N.A. | Bechtel, Inc. | APCI-MCR | 1983 — U.C. |
| MALAYSIAN LNG SDN. BHD. Bintulu, Sarawak, Malaysia | 850 | 5880 | 1636 (4 x 409) | N.A. | I.H.I. | Pullman Kellogg — Japan Gasoline Co. Ltd. | API-MCR | 1982 — U.C. |
| WOODSIDE LNG PTY. LTD. Withnell Bay, Western Australia | 900 | N.A. | N.A. | N.A. | N.A. | N.A. | N.A. | 1987 — Planned |

# Import/Receiving Terminals

| Company and Plant Site | Storage Capacity | | Capacity | Regasification — MMcfd | | Type of Storage Container | Storage Contractor | Systems Contractor | Year of Operation |
|---|---|---|---|---|---|---|---|---|---|
| | MMcf | Mbbl | | Runs | Type | | | | |
| BRITISH GAS CORP. Canvey Island, England | 1400 | 292 (6 – 60 + 2 – 16) | 300 | 3 at 50<br>1 at 50<br>2 at 50 | Submrgd<br>Seawater<br>Intermediate fluid/seawater | Frozen hole<br>Aboveground, aluminum | Conch/McAlpine<br>APV and Whessoe | Gas Corp. | 1959, 1963, 1967 |
| GAZ DE FRANCE Montoir de Bretagne | 5300 | 1512 (2 x 756) | 910 | 4 at 228 | Estuary water | Aboveground, concrete | Chantiers Modernes; Europe Etudes; Technigaz; Bignier-Schmidt-Laurent | Gaz de France | 1981 |
| GAZ DE FRANCE Montoir de Bretagne | 2650 | 756 | — | — | — | Aboveground, 9% nickel | C.M.P. | — | 1983 — U.C. |
| GAZ DE FRANCE Le Havre, France | 792 | 229.5 (3 x 76.5) | 75 | 3 at 25 | Seawater Fluid | Aboveground, 9% nickel | CBI lic. | Gaz de France | 1963 |
| GAZ DE FRANCE Fos-Sur-Mer, France | 1500 | 450 (2 x 225) | 424 | 4 at 106 | Intermed. Fluid | Aboveground, aluminum | CBI lic. | Gaz de France | 1971 |
| GAZ DE FRANCE Fos-Sur-Mer | 1000 | 290 | 425 | — | — | Aboveground, 9% nickel | C.M.P. | | 1979 — third tank |
| ENAGAS, S.A., Barcelona | 1800 | 500 (2 x 250) | 155 | 1 at 67<br>2 at 44 | Seawater | Aboveground, concrete | Preload/Christiani and Nielsen | Esso R&D | 1969 |
| | 1800 | 500 | 268 | 2 at 67<br>2 at 67 | Seawater submrgd | Aboveground, 9% nickel | Felguera Provence | CBI | 1974 |
| | 1800 | 500 | 536 | 4 at 134 | Seawater | Aboveground, concrete | Preload Auxini | Preload Auxini | 1981 |
| SNAM (ENI) La Spezia, Italy | 2100 | 630 (2 x 315) | 353 | 2 at 176.5 | Intermed. Fluid | Aboveground, 9% nickel | SAIPEM (PDM lic.) | Esso R&D | 1969 |
| DEUTSCHE FLUSSIGERD GAS TERMINAL Gmbh Wilhelmshaven, Ger. | 5300 | 1508 (4 x 377) | 2160 | 16 at 135 | Submrgd/seawater | Aboveground, concrete and 9% nickel | Dyckerhoff Widmann — CMP | Linde A.G. | 1980's — Planned |
| DISTRIGAZ, S.A. Zeebrugge, Belgium | 9072 | 2520 (4 x 630) | 1000 | 10 at 100 | Submrgd | Half underground | N.A. | Tractebel | 1986 — U.C. |
| TOKYO GAS CO./TOKYO ELECTRIC, Negishi, Yokohama, Japan | 3469 | 1010 (2 x 284) (2 x 221) | 224<br>56 | 4 at 56<br>1 at 56 | Seawater<br>Submrgd | Aboveground, 9% nickel | IHI | Tokyo Gas Co. | 1969 |
| | 215 | 63 | 56 | 1 at 56 | Submrgd | Inground concrete and SUS membrane | IHI | | 1970 |
| | 1287 | 378 | | | | Inground concrete and SUS membrane | IHI | | 1972 |
| | 979 | 284 | 191 | 1 at 93<br>1 at 49<br>1 at 49 | Seawater<br>Seawater<br>Submrgd | Aboveground, 9% nickel | IHI | Tokyo Gas Co. | 1972 |
| | 544 | 158 | | | | Aboveground, 9% nickel | IHI | | 1973 |
| | 2038 | 599 | 110 | 1 at 110 | Submrgd | Inground concrete and SUS membrane | IHI/Kajima | Tokyo Gas Co. | 1977 |
| | 2038 | 599 | 110 | 1 at 110 | Submrgd | Inground concrete and SUS membrane | IHI/Kajima | | 1978 |
| | 2038 | 599 | 110 | 1 at 110 | Seawater | Inground concrete and SUS membrane | Nippon Kokan | Tokyo Gas Co. | 1979<br>1981 |
| | 2038 | 599 | | | | Inground concrete and SUS | Kawasaki Heavy Industries | | 1982 |
| TOKYO GAS CO./TOKYO ELECTRIC, Sodegaura, Chiba, Japan | 1931 | 568 (2 x 284) | 330 | 3 at 66<br>2 at 66 | Seawater<br>Submrgd | Aboveground, Al | IHI | Tokyo Gas Co. | 1973 |
| | 1287<br>2574 | 378<br>756 (2 x 378) | 418 | 3 at 66<br>4 at 55 | Seawater<br>Seawater | Aboveground, Al<br>Inground concrete and SUS membrane | IHI | Tokyo Gas Co. | 1974 |
| | 1931 | 568 (2 x 284) | | | | Aboveground, Al | IHI | | 1974 |
| | 2574 | 756 (2 x 378) | | | | Aboveground, Al | IHI | | 1975 |
| | 1287 | 378 | 340 | 2 at 110<br>1 at 60<br>1 at 60 | Seawater<br>Seawater<br>Submrgd | Inground concrete and SUS membrane | IHI | Tokyo Gas Co. | 1976 |
| | 2574 | 756 (2 x 378) | | | | Aboveground, Al | IHI | | 1977 |
| | 5148 | 1512 (4 x 378) | 613 | 2 at 110<br>2 at 131<br>1 at 131 | Seawater<br>Seawater<br>Submrgd | Inground concrete and SUS membrane | IHI | Tokyo Gas Co. | 1977 |
| | 2574 | 756 (2 x 378) | | | | Inground concrete and SUS membrane | Kajima-MHI | | 1978 |
| | 2574 | 756 (1 x 391) (1 x 365) | | | | Inground concrete and SUS membrane | IHI | | 1979 |
| | 2574 | 756 (2 x 378) | | | | Inground concrete and SUS membrane | Kajima-MHI | | 1979 |
| | 1287 | 378 | | | | Inground concrete and SUS membrane | Kajima-IHI | | 1981 |
| | 5578 | 1640 (2 x 820) | | | | Inground concrete and SUS membrane | MHI-Kajima<br>IHI-Shimizu | | 1982 |
| TOKYO GAS & TOKYO ELECTRIC Sodegaura, Japan | 8349 | 2454 (3 x 818) | — | — | — | Aboveground, 9% nickel | IHI, MHI, NKK | | 1982 |
| | 3854 | 1132 (2 x 566) | — | — | — | Inground, concrete and SUS membrane | MHI and Kawasaki Heavy Industries | | 1982 |
| OSAKA GAS CO. Senboku I, Osaka, Japan | 3820 | 1120 (3 x 280) – underground) (1 x 280 – aboveground) | 180 | 3 at 40<br>1 at 40 | Seawater<br>Intermed Fluid | Aboveground, aluminum (1) 9% nickel (2)<br>Inground concrete and SUS membrane | IHI<br>IHI/Ohbayashi | Osaka Gas | 1971 |
| OSAKA GAS CO. Senboku II, Osaka, Japan | 16,208 | 4700 (10 x 470) | 540 | 7 at 60<br>2 at 60 | Seawater<br>Thermal Fluid | Aboveground, aluminum (3) 9% nickel (7) | IHI and Toyo Kanetsu K K | Osaka Gas | 1977 |
| | 9104 | 2350 (5 x 470) | — | — | — | Aboveground, 9% nickel | N.A. | N.A. | N.A. |
| KITA KYUSHU LNG CO. Tobata, Fukuoka, Japan (Kyushu Electric/Nippon Steel) | 7722 | 2268 (6 x 378) | 678 | 4 at 142<br>1 at 110 | Seawater<br>Submrgd | Aboveground, 9% nickel | IHI Toyokanetsu | IHI | 1977 |
| CHUBU ELECTRIC/TOHO GAS CO. Chita, Aichi, Japan | 3218 | 1892 (2 x 473) | 318 (2 x 473) (2 x 473) | 3 at 142<br>1 at 66<br>4 at 22<br>1 at 22 | Seawater<br>Submrgd<br>Seawater<br>Submrgd | Aboveground, Al<br>Aboveground, 9% nickel | IHI<br>Toyokanetsu | IHI | 1979<br>1977 |
| | 5090 | 3500 (6 x 583) | — | — | — | Aboveground, 9% nickel | N.A. | N.A. | N.A. |
| KANSAI ELECTRIC/OSAKA GAS Himeji, Hyogo, Japan | 2905 | 1761 (3 x 503)<br>(1 x 252) | 625 | 5 at 125 | Seawater | Aboveground, 9% Nickel — 2 tanks Aluminum — 1 tank<br>Aboveground Aluminum | IHI | IHI | 1979 |
| | 2905 | 1750 (3 x 583) | — | — | — | Aboveground, 9% nickel | N.A. | N.A. | N.A. |
| ALGONQUIN LNG INC. Providence, R.I. | 2000 | 600 | 380 | 3 at 100 | Direct Fluid | Aboveground, 9% nickel | CBI | CBI | 1973 |
| COLUMBIA LNG CORP. & CONSOLIDATED SYSTEM LNG. CO., Cove Point, Maryland | 5000 | 1500 (4 x 375) | 1000<br>200 | 10 at 100<br>2 at 100 | Intermed. Fluid | Aboveground, aluminum | PDM | Pullman Kellogg & Raymond Technical | 1977 |
| DISTRIGAS CORP. Everett, Mass. | 3250 | 974 (1x374 + 1x600) | 135 | 3 at 45 | Submrgd | Aboveground, 9% nickel | CBI | CBI | 1971 |
| NATURAL GAS PIPELINE CO. OF AMERICA (Peoples Gas) Ingleside, Tex. | 6804 | 1890 (3 x 630) | 1124 | 11 at 104 | Seawater Submrgd | Aboveground, 9% nickel | N.A. | N.A. | 1980's — Planned |
| SOUTHERN ENERGY CO. Elba Island, Ga. | 4000 | 1200 (3 x 400) | 540 | 5 at 108 | Submrgd | Aboveground, aluminum | CBI | Bechtel Inc. and Raymond Technical | 1977 |
| TRUNKLINE LNG CO. Lake Charles, La. | 6000 | 1800 (3 x 600) | 700 | 7 at 100 | Submrgd | Aboveground, 9% nickel | PDM | Pullman Kellogg Co. and Raymond Technical | 1981 |
| WESTERN LNG TERMINAL CO. Little Cojo, Calif. | 5775 | 1650 (3 x 550) | 1200 | 12 at 100 | Direct seawater | Aboveground, 9% nickel | N.A. | Fluor | 1985 — Planned |

***International LNG Report***

# Future World LNG Trade Looks Good — Part 1

by **P.J. Anderson,** *Consulting Editor, Technology*

As 1982 draws to a close, development of international trade of LNG may be reaching a point where the growth curve becomes nearly flat. This slowed development may last until much later in the decade. In 1983 and 1984, we should see the implementation of two remaining projects under construction: Malaysia-Japan and the Indonesia-Japan expansions. No other project have progressed to where they can be implemented before 1986. Slippage appears to be the rule for these proposed projects.

This is not to say that growth in international trade in gas by pipeline or as LNG is over. According to the International Energy Agencies' forecast of natural gas use through the

**TABLE 1.**
**Operational Base-Load LNG Import Projects**

| Trade | Contract Initial Delivery | Contract Term, yr | Companies Involved | Daily Gas Volume, MMcf |
|---|---|---|---|---|
| **Algeria — France**<br>Arzew — Le Havre | 1964 | 25 | SONATRACH<br>Gaz de France | 50 |
| **Alaska — Japan**<br>Kenai — Neigishi | 1969 | 15* | Phillips Petroleum Co.<br>Marathon Oil Co.<br>Tokyo Electric Power Co.<br>Tokyo Gas Co., Ltd. | 135 |
| **Libya — Italy**<br>Marsa el Brega — La Spezia | 1969 | 20 | Sirete Oil Co.<br>SNAM | 235 |
| **Libya — Spain**<br>Marsa el Brega — Barcelona | 1969 | 15 | Sirete Oil Co.<br>ENGAS | 110 |
| **Brunei — Japan**<br>Lumut-Sodegura<br>Neigishi, Semboku | 1972 | 20 | Brunei LNG, Coldgas Trading<br>Osaka Gas Co., Ltd., Tokyo<br>Gas Co., Ltd., Tokyo Electric Power Co. | 745 |
| **Algeria — France**<br>Skikda — Fos sur Mer | 1973 | 25 | SONATRACH<br>Gaz de France | 350 |
| **Algeria — U.S.**<br>Skikda — Everett | 1971 | 20 | SONATRACH<br>Distrigas | 115 |
| **Algeria — Spain**<br>Arzew — Barcelona | 1976<br>(full delivery 1982) | 23 | SONATRACH<br>Empresa Nacional de Gas | 450 |
| **Abu Dhabi — Japan**<br>Das Island — Tokyo | 1977 | 20 | Abu Dhabi Liquefaction Co.<br>Tokyo Electric Power Co. | 355 |
| **Indonesia — Japan**<br>North Sumatra,<br>East Kalimantan —<br>Japanese Terminals | 1977 | 20 | Pertamina, Osaka Gas Co., Ltd.<br>Kunsai Electric Power Co.<br>Chubu Electric Power Co.<br>Kyushu Electric Power Co.<br>Nippon Steel | 1085 |
| **Algeria — Belgium**<br>Arzew — Zeebrugge | 1982 | 20 | SONATRACH<br>Distrigas, S.A. | 250<br>until Jan. 1, 1986<br>(delivered to Montoir) |
| **Algeria — U.S.**<br>Arzew — Lake Charles, LA. | 1982 | 20 | SONATRACH<br>Trunkline Gas Co.<br>Trunkline LNG Co. | 450 |
| **Algeria — France**<br>Arzew — Montoir-de-Bretagne | 1982 | 20 | SONATRACH<br>Gaz de France | 530 |

*Five year extension applied for.*

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year 2000, OECD demand for gas in the year 2000 will be between 1012 billion $m^3$ and 1235 billion $m^3$ – an annual growth rate of between 1% and 1½% from the 1980 level of 896 billion $m^3$.

In the year 2000, OECD production will account for between 706 and 1056 billion $m^3$ of requirements, leaving probable net imports from outside the OECD of between 179 and 306 billion $m^3$. Using these figures, imports will have increased at an annual rate of between 6% and 9%, several times the rate at which demand is expected to increase, from a 1980 level of 55 billion $m^3$. Firm plus potential imports in 2000 are cited at a level of 269 billion $m^3$. Of the firm imports, LNG is projected to account for 56 billion $m^3$ or 21%. That share, although still very respectable, is down from the 56% of imports that existed in 1980. Concerning potential imports, the IEA study calls for OECD gas imports to be 154 billion $m^3$ in the year 2000 of which 87 billion $m^3$ or 56% will be as LNG. This represents a significant volume that could be realized, which the LNG industry will seek to capture.

A study by the Economics Department of the Institut Francais du Petrole forecasts that international trade in gas will grow at an annual rate of 2 to 3% through the year 2000. It predicts that international trade will rise from the 200 billion $m^3$ level of 1980 to 450 to 650 billion $m^3$ over the 20-year period. Of this, LNG trade will grow from 32.5 billion $m^3$ in 1980 to between 200 and 300 billion $m^3$ at the turn of the century.

Whether LNG trade grosses at an annual rate of 8%, as the IEA projects for firm and potential imports, or 11%, as IFP forecasts, there will be substantial net growth in LNG world trade. Whether that growth takes place as a smooth curve or a step function will depend on a host of political and economic factors. These factors have been discussed at greath length in numerous articles. Therefore, in this article, we will look briefly at the status of the individual current and projected LNG trades.

## Operational Projects

Currently operational projects are shown in Table 1. Included in this list is the Algeria-United States project, which involves Trunkline LNG and SONATRACH, and (initiated on Sept. 11 with the lifting of the first cargo) and the Algeria-Belgium project, which involves Distrigaz S.A. and SONATRACH, that was scheduled to begin in October with deliveries to Gaz de France's Montoir de Bretagne terminal. Deliveries to the Zeebrugge, Belgium, begin Jan. 1, 1986.

The volume of LNG represented by these projects is 4.85 billion cu ft per day (47.7 billion $Nm^3$/yr). Of this volume, 2.32 billion cu ft per day (22.8 billion $Nm^3$/yr) or 48% will be delivered to Japan, 1.98 billion cu ft per day (19.4 billion $Nm^3$/yr) or 41% to Europe, and the remaining 0.56 billion cu ft per day (5.5 billion $Nm^3$/yr) or 11% to the U.S. Asian sources would account for 38% of exports, North African sources 51%, Middle East 7%, and North America 3%, if contracted volumes were to be delivered.

Unfortunately, this was not the case. Deliveries from Asian nations, Alaska, and the Middle East to Japan were near or at contractual quantities. Those from North Africa to Europe were not.

Deliveries from Libya to Spain continued; those from Italy remained suspended. On Nov. 12, 1981, Exxon Corp. announced that it was withdrawing from all its oil and gas operations in Libya. This included the Marsa el Brega liquefaction plant. The Libyan National Oil Corp. is now operating that plant through a subsidiary, Sirte Oil Co. Exxon is providing transport for the LNG delivered to Spain under charter.

In reaching its amended pricing provisions, SONATRACH

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delayed implementation of the Trunkline LNG and Gaz de France projects. Deliveries to Gaz de France began on March 19, 1982, with the arrival of the *Ramdane Abane* from Arzew at the Montoir de Bretagne terminal. Deliveries should be at full levels some time in 1983. Initial deliveries for Belgium's Distrigaz were to have been initiated in October through Montoir. Full delivery levels to Trunkline at Lake Charles are to be reached in December when six cargoes are to be delivered. Coincidentally, Gaz de France reached agreement on an amended pricing provision covering all of their contracts on Feb. 2, 1982, and Trunkline on Aug. 6.

The France-Algeria agreement, reached on a government-to-government basis, has not been disclosed. It is widely reported to include a base price of $5.10/million Btu FOB indexed on a dollar-for-dollar change of the market basket of crude oils. It is understood that the price includes both economic and political premium values. The economic portion is believed to be 86.5% of the price, and the political premium 13.5%. That price, revised quarterly, is understood to be approximately $4.77/MMBtu for the third quarter of 1982. The deescalation of $0.33/MMBtu reflects deescalation in the values of the crude oils. The FOB price Algeria negotiated by the French government is higher than the price it will pay at the German-Czechoslovakian border for Soviet gas.

On July 1, Trunkline LNG Co. and Panhandle Eastern PipeLine Co. filed arbitration documents with the International Chamber of Commerce as provided in the contract with SONATRACH to resolve controversies. The Trunkline-Panhandle position was that they knew of no technical reasons why LNG deliveries should not be initiated. The facility at Arzew was exporting LNG to Gaz de France's terminal at Montoir. They stated that total Algerian operable liquefaction capacity is 31.1 billion m$^3$/yr to cover sales commitments of 21.8 billion m$^3$/yr. The LNG tankers required to lift the cargoes were available; these are the tankers dedicated to the trade. The receiving terminal was ready to receive a cargo for cooldown.

SONATRACH had cited technical reasons for the delay in initiating deliveries at previous meetings with Trunkline-Panhandle.

At a scheduled meeting on Aug. 6, the parties agreed upon an amendment to the pricing provisions of the 1975 gas purchase contract. A shipping schedule was worked out that called for the first carrier to load at Arzew on Sept. 11. Full contract deliveries of six cargoes are scheduled for December. If achieved, this would trigger provisions of the contract under which Trunkline-Panhandle would file the amendment with U.S. regulatory authorities: DOE's Economic Regulatory Administration and the Federal Energy Regulatory Commission.

Until filed, provisions of the amendment stipulate that its provisions are to be released only to the extent required by law in both countries. From information that has been released, provisions include a new base price as of July 1, 1982, of $3.92/MMBtu. That price is to escalate/deescalate directly with changes in the average of the official posted export prices of five crude oils. Terms of the current contract (1975) remain in effect until approved by authorities having jurisdiction in Algeria and the U.S.

Although no interruptions in deliveries had occurred, Distrigas Corp. and SONATRACH announced that they had reached agreement on a new contract on Aug. 2. On Aug. 28, Distrigas filed applications with ERA and FERC that included a copy of the new agreement. Principal provisions were cited as:

1. An increase in the FOB price to $4.44/MMBtu;
2. A quarterly adjustment of the FOB price based upon average of six different crude oils;

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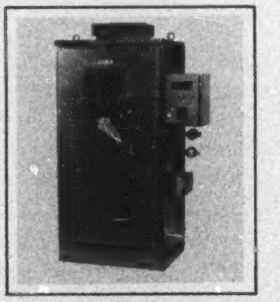

3. A reduction in the take-or-pay obligation of Distrigas to SONATRACH[1] so that now Distrigas will be obligated to accept annual deliveries from only 14 ships; and

4. A modification of the delivery schedule to provide that delivery of the LNG cargoes will more closely coincide with the requirements for LNG of DOMAC's customers. (Nine cargoes will be delivered in the winter and five cargoes in the summer.)

5. An option,[2] exercisable in the sole discretion of Distrigas, to receive up to three additional ships in any one contract year

6. A change in method of calculating the Btu content of the LNG sold by SONATRACH and a resulting price reduction of approximately 5¢/MMBtu

7. Establishment of provisions to minimize demurrage

8. Postponement of the next contract review by two years until January 1986

9. A surcharge designed to give effect to the new, FOB price from and after the date of filing of this application.

Simultaneous with the execution of the amendment, the parties executed one side letter dealing with claims for demurrage and deadfreight relating to the period prior to July 1, 1982, and a second side letter setting forth the calculation of the surcharge referred to in provision No. 9 above.

Under the amendment, the new formula used to calculate the FOB price is as follows:

$$P = P_1 + (B - Bo)$$

in which:

P = the FOB price of LNG in U.S. dollars/MMBtu calculated to the sixth decimal place, the first date of the first month of each quarter of the Gregorian Calendar, to be applied in the course of such quarter, hereafter referred to as the "Quarter of Application"

$P_1$ = the base price, equal on July 1, 1982, to U.S. dollars 4.44/MMBtu to be applied during the third quarter of 1982

B = the arithmetic average, during the quarter preceding the Quarter of Application of the average prices, expressed in U.S. dollars/MMBtu, of the crude oils whose characteristics are set forth hereafter.

For calculation of B, the average price of each crude oil listed below is to be the arithmetic average of the daily prices of such oil, expressed in U.S. dollars/MMBtu, during the quarter preceding the Quarter of Application.

Conversion of the prices of such crude oils expressed in U.S. dollars/bbl to prices expressed in U.S. dollars/MMBtu is made based on the gross heating values that follow:

| Crude Oils | Gravity, °API | Gross Heating Value, $10^6$ Btu/bbl |
|---|---|---|
| Arabian Light (Saudi Arabia) | 34 | 5.84 |
| Sahara Blend (Algeria) | 44 | 5.60 |
| Bonny Light (Nigeria) | 37 | 5.77 |
| Isthmus (Mexico) | 32 | 5.89 |
| Minas (Indonesia) | 34 | 5.84 |
| Tia Juana (Venezuela) | 26 | 6.03 |

The prices are to be official prices exclusive of rebates, premiums, or surcharges. Prices are to be those published by Platt's Oilgram Price Report (New York Edition). The price in effect is to be weighted by the number of days during which it has been in effect.

Bo = The value of B in the third quarter of 1982, that is, U.S. $5.879572/MMBtu, resulting from the calculation shown in the table:

---

[1] *The present take-or-pay obligation of Distrigas is 17 cargoes.*

[2] *This option permits Distrigas one additional ship to any quarter. From and after 1986, its option is reduced to two ships annually.*

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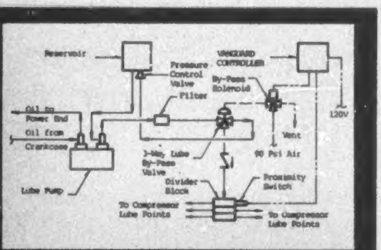

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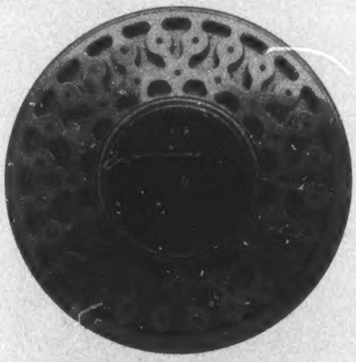

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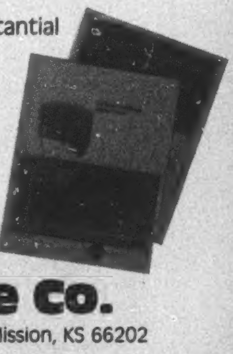

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| Crude Oils | Price 2nd Quarter 1982<br>$/bbl | <br>$/$10^6$ BTU |
|---|---|---|
| Arabian Light (Saudi Arabia) | 34.00 | 5.821918 |
| Sahara Blend | 35.50 | 6.339286 |
| Bonny Light (Nigeria) | 35.50 | 6.152513 |
| Isthmus (Mexico) | 32.50 | 5.517827 |
| Minas (Indonesia) | 35.00 | 5.993151 |
| Tia Juana (Venezuela) | 32.88 | 5.452736 |
| **Arithmetic Average** | | 5.879572 |

On May 7, Phillips Petroleum Co. and Marathon Oil Co. filed an application seeking an ERA Order to approve continued exportation of 50.57 trillion Btu (approximately 135 MMcfd) of Alaskan LNG annually to Japan in the period between 1984 to 1989. Export would be carried out under an Amendatory Extension Agreement (dated April 15, 1982) to the 1967 Basic Agreement with Tokyo Gas Co., Ltd., and the Tokyo Electric Power Co., Inc.

Specifically, the Amendatory Agreement includes a provision that extends the term of the Basic Agreement (March 6, 1967) for a period of five years from June 1, 1984, to May 31, 1989. It further establishes a mechanism whereby authorized quantities of LNG, which are not delivered in any of the five years of the contract extension, are to be delivered in subsequent contract years or during a maximum seven-month makeup period beginning June 1, 1989.

In addition to approval of the contract extension, Phillips and Marathon also requested that ERA authorize makeup for the under-deliveries of LNG that have occurred during the 15-year term of the Basic Agreement. Total makeup volume as of May 31, 1982, is estimated at 3.2% of the cumulative contract quantity to that date. The applicants state that no additions to or alterations of the existing facilities, including two LNG tankers, are required for or contemplated during the 5-year extension period.

Pricing provisions covering the five-year extension period are contained in the 13th Amendatory Agreement dated April 15, 1982. Pricing provisions under Article 9 call for a c.i.f. base price of 592.8 U.S. cents/MMBtu as indexed to reflect changes in the weighted average of government selling prices of a basket of 20 crude oils imported into Japan. The specific formula and provisions include:

$$\text{Price for calendar month} = 592.8 \left[\frac{\text{Av. GSP (Month Prior to Calendar Month)}}{34.48}\right]$$

where:

Av. GSP is the average of the government selling prices (in U.S. dollars per barrel) weighted by the 1981 volumes for the top 20 crude oils (ranked by descending volumes) imported into Japan during the calendar year of 1981.

Sellers and buyers shall be free to request a renegotiation of the price if there are significant changes.

The Algeria-United Kingdom project has only received one spot cargo of Algerian LNG since the interim agreement to extend the project expired in June 1981. That cargo, lifted in February 1982, was used to keep the four cryogenic in-ground storage pits cold until procedures were implemented to decommission them. Filling of the four 300,000-bbl capacity containers was completed in July. The Canvey Island terminal facility will be maintained for peakshaving purposes using its 10.3 MMcfd liquefier to produce LNG from North Sea gas. The LNG would be stored in the 392,000 bbl of capacity available in the six small, conventional tanks. A project has also been completed to use 3000 tons of LPG storage capacity at the facility to supply LPG-air for peakshaving in the regional transmission system. **P&GJ**

**NEXT MONTH: Part two discusses LNG projects under construction around the world, and discusses in detail 10 major "possible projects."**

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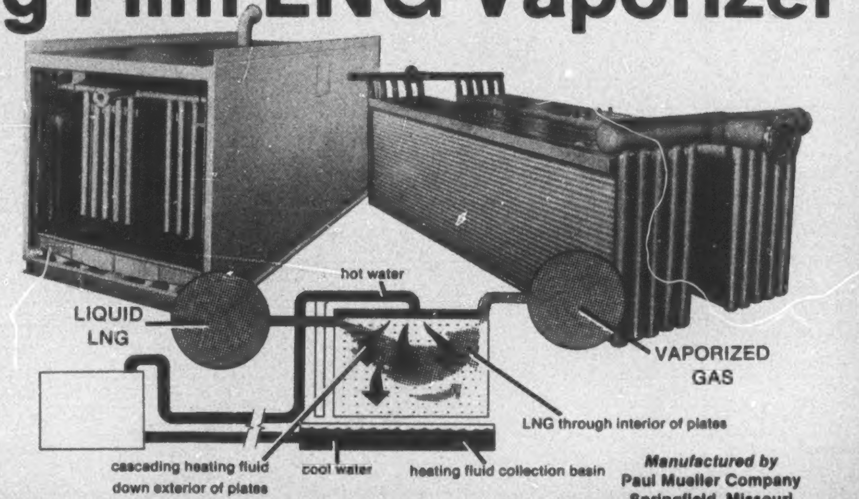
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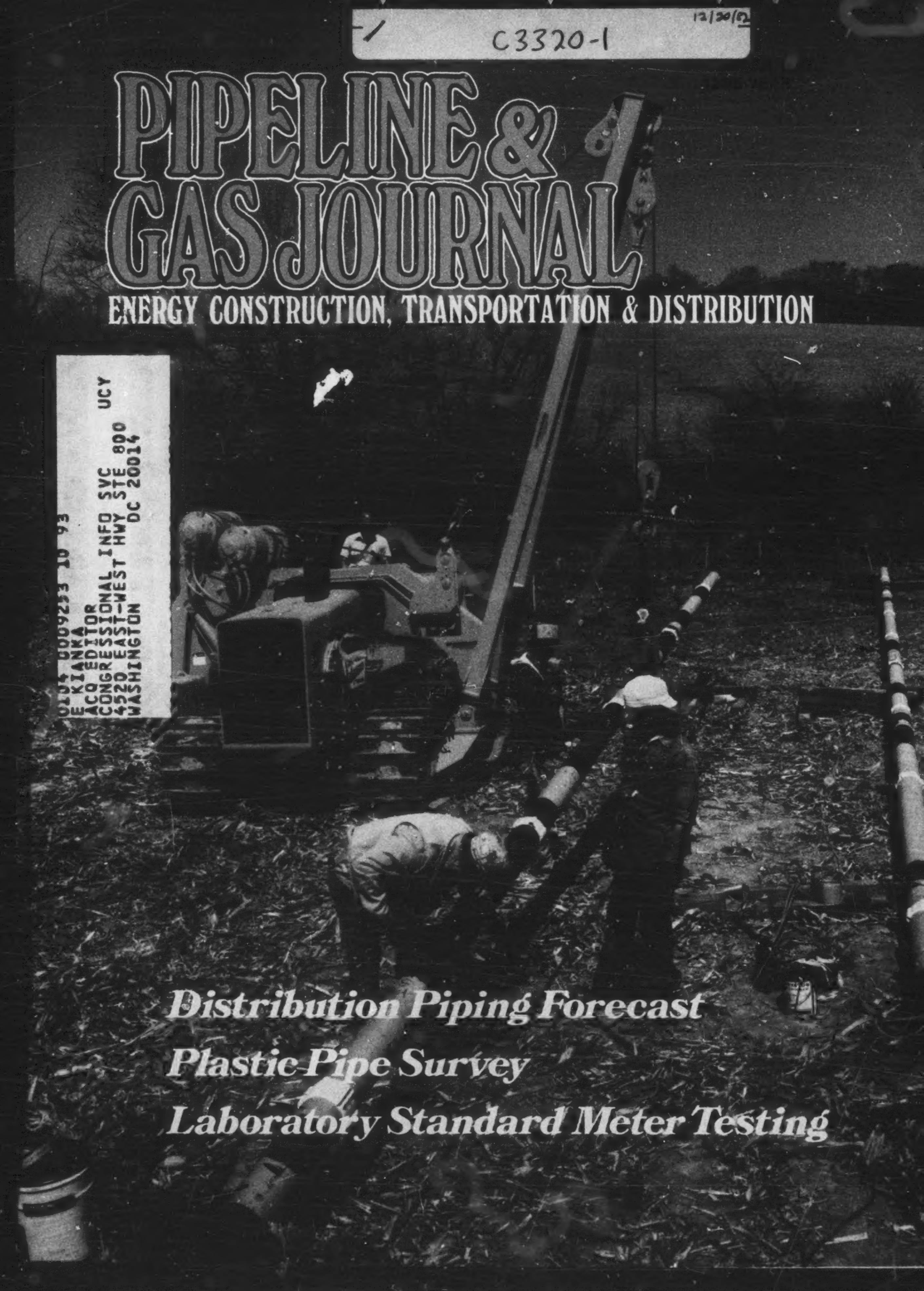

*Distribution Piping Forecast*

*Plastic Pipe Survey*

*Laboratory Standard Meter Testing*

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*International Pipeline & Gas Utility Design, Construction & Operation*

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Jack Johnson, Contractor, Uses Innovative Machinery, Techniques ........ 33

Iowa contractor who specializes in distribution piping and small pipeline installations – and unique projects such as tile replacement where big-inch lines go through farm country – is always ready to try "something new."

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New type of piping system devised as a solution to problem of LNG spills.

**COVER**

Jack Johnson, contractor, featured in this issue (page 33), is a believer in new equipment innovations, such as this hydraulic sideboom with only three controls that can quickly handle pipe in the field.

**Service crew runs plastic service** to one of the more than 400,000 new gas customers added in 1982. *photos courtesy Lone Star Gas Co.*

# Distribution Piping Expenditures Of $2.66 Billion Seen For 1983

**by Jim Watts,** *Assistant Editor*

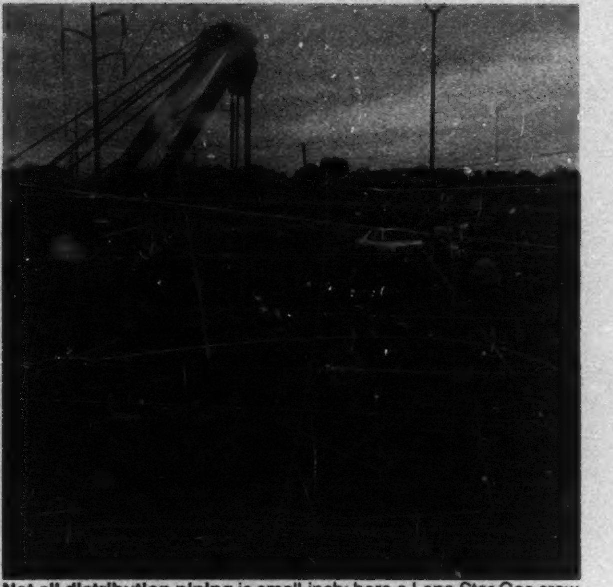
Gas distribution utilities in the U.S. will spend a record $2,661,854,500 in 1983 on system expansion, replacement, and maintenance to add another 25,767 miles of piping to the nation's 1.381 million mile natural gas distribution network.

If projections of the gas distribution utility executives polled in PIPELINE & GAS JOURNAL's 17th annual distribution survey hold true, 1983 will be a record year for distribution capital expenditures – up 11.6% from 1982 and 9.6% more than 1981. The amount of piping installed will be 8.4% more than 1982's 23,610 miles but 7.8% less than the 27,952 miles installed in 1980.

The estimates for 1982 contained in the December 1981 survey results proved to be too optimistic, as the housing construction slump lasted through the year. Many survey respondents this time noted almost no housing construction in their area. Last year, estimates were for expenditures of $2.65 billion and installation of 25,167 miles, but the actual figures were $2.352 billion in capital expenditures and installation of 23,609 miles, declines of 11.2% and 6% respectively.

In 1982, U.S. gas distribution utilities spent $1,503,734,000 on new and replacement mains and services and $848,819,350 on maintenance of the system. Gas main installations totaled 11,268 miles and 12,341 miles of services were installed. The 1983 projections are for expenditures of $1,735,884,100 for new and replacement mains and service lines and $925,970,400 for maintenance. An estimated 13,506 miles of mains and 12,261 miles of service lines will be installed in 1983.

The inflationary pressures on gas distribution piping costs seem to have



**Not all distribution piping** is small-inch: here a Lone Star Gas crew installs a 24-in. distribution main.

### Gas Distribution Utility Expenditures

| | 1981 | 1982 | 1983 est. |
|---|---|---|---|
| New and replacement mains and service lines | $1,524,783,000 | $1,503,734,000 | $1,735,884,100 |
| Maintenance of system | 881,475,480 | 848,819,350 | 925,970,400 |
| TOTALS | $2,406,258,480 | $2,352,553,350 | $2,661,854,500 |

### Gas Distribution Utilities Pipe Installed, Miles

| | 1980 | 1981 | 1982 | 1983 est. |
|---|---|---|---|---|
| Gas mains | 13,573 | 11,535 | 11,268 | 13,506 |
| Gas service lines | 14,379 | 13,188 | 12,341 | 12,261 |
| TOTALS | 27,952 | 24,723 | 23,609 | 25,767 |

### Gas Distribution Utilities – Pipe Installed – Total Miles "In Ground" As Of 12-31-82

| | |
|---|---|
| Gas mains | 842,991 |
| Gas service lines | 537,942 |
| TOTAL | 1,380,933 |

eased. 1983 projections are for an 11.6% increase in costs and an 8.4% increase in piping mileage. In 1982, mileage installed was down 4.5% compared to 1981, but costs were down only 2.24%.

Maintenance as a percentage of the total construction budget has been steady over the past three years – 36.6% in 1981, 36.1% in 1982, and an estimated 34% in 1983. The amount spent for system maintenance upgrading rose an astonishing 40% from 1980 to 1981, but has leveled off with a decline of 3.7% from 1981 to 1982 and an increase of 9% from 1982 to 1983's estimate.

Approximately 427,000 customers were added by gas utilities in 1982, close to the 500,000 new customers estimated in the 1982 projections last year. Of those new customers, 98,462 are conversions from oil or electric heating and 263,770 are attributed to new construction. The record year for new customers was 1980, when 685,000 customers were added.

The outlook for additional customers is somewhat murky in 1983. The pricing advantage gas enjoyed over oil and electric heating has been evaporating, and with gas price deregulation set for Jan. 1, 1985, many potential customers are apparently waiting to see what will happen. The convenience and cleanliness of gas heating is still an important factor, however, and if housing construction picks up again by mid-year 1983 could be a very good year for gas utilities.

By the end of 1982, the U.S. gas distribution network will total 842,991 miles of gas mains and 537,942 miles of service lines, totaling 1,380,993 miles of distribution piping serving an estimated 49.8 million customers.

Data for the 1982 results and 1983 projections of expenditures and pipe mileage was compiled in a survey of 500 gas distribution utilities in 50 states, including the 300 largest gas distribution utilities as reported in THE P&GJ 500, August 1983 issue.

## Maintenance Vs. Construction

Along with projections on piping mileage and expenditures, P&GJ asked for projections and opinions on how the current economic situation is affecting maintenance and construction budgets. Comments included:

"Revenue producing extensions are still down because of slump in housing construction."

"Main extensions and new services have been greatly reduced."

"We are receiving lower bid prices on contracted work."

"We have reduced and eliminated outside contractors."

"Very little new construction is planned. Our maintenance programs have been cut back 75%, and we are doing just what we have to."

"Decrease in new housing construction has had a significant effect in customer acquisition. The economy has also affected the oil conversion rate."

"Economic conditions have not affected our maintenance."

"We are evaluating projects more critically, looking for less expensive methods, with better and more emphasis on budget control and accurate estimating."

"We are investigating the economics of staffing and maintaining company labor and equipment."

## Few Restrictions

What a difference a few years makes. Unlike previous surveys, few of the utilities report any restrictions on customer attachments, and then only in special cases. Some of the comments include:

"Some restrictions on industrial."

"Yes, 100,000 Btu load minimum."

"Only on firm industrials in excess of 50 Mcfd."

"Firm loads in excess of 199 Mcfd must receive special approval in accordance with our supplier's tariff. All other firm loads accepted, no restrictions on interruptible loads."

"Any customer using more than 300 Mcfd must be interruptible, and new heating customers must meet weatherization standards set by the PUC."

## Wish List

From the responses received, it appears there is a pot of gold awaiting the inventor that can come up with a method for detecting plastic pipe that has been installed without a tracer wire. That was one item mentioned over and over by utility executives who answered the question, "What three new piping products and materials would you like most to see produced or evolved from research?" Comments included:

"Plastic pipe locators."

"Improved repair fittings for large diameter plastic."

"Plastic-to-cast iron pullout resistant coupling."

"Method of locating plastic pipe integral to the pipe, not a buried wire."

"Higher operating pressures for plastic; better leak detection devices."

"Good, inexpensive, strong plastic valve."

"Chemical means of joining PE pipe and tubing."

**P&GJ**

# Plastic Pipe Maintains Lion's Share Of Market

by **Jim Watts**, *Assistant Editor*

Plastic pipe dominated the distribution piping market in 1982, marking the 9th straight year plastic has accounted for more than 50% of all distribution pipe installed and for the third year in a row more than 75% of all pipe installed was plastic. In 1982, 79.9% of the 23,610 miles of new and replacement mains and services were plastic, compared to 84.2% in 1981 and 78% in 1980. For 1983, projections are for 75.2% of the 25,767 miles of new and replacement mains and services to be plastic, according to PIPELINE & GAS JOURNAL's 17th annual distribution piping survey.

Nearly all the 18,863 miles of plastic pipe installed in 1982 was polyethylene.

In 1982, 18,863 miles of plastic was installed by U.S. gas distribution utilities, with 19,371.5 miles of plastic pipe expected to be installed in 1983. As of Dec. 31, 1982, an estimated 215,494 miles of plastic gas distribution piping will be in the ground in the U.S., or 15.6% of the total network of 1,380,933 miles. Gas utilities reporting using plastic pipe in their system total 938, with 72 major users – those utilities having more than 750,000 ft (142 miles) of plastic in their system.

Plastic usage, as a percentage of all gas distribution piping installed each year, has been over 70% since 1980 and above 50% since 1974. The record is:

- 1966 . . . 12.0% was plastic
- 1967 . . . 13.5% was plastic
- 1968 . . . 16.5% was plastic
- 1969 . . . 19.0%was plastic
- 1970 . . . 21.2% was plastic
- 1971 . . . 24.9% was plastic
- 1972 . . . 31.3% was plastic
- 1973 . . . 42.2% was plastic
- 1974 . . . 50.6% was plastic
- 1975 . . . 55.8% was plastic
- 1976 . . . 54.5% was plastic
- 1977 . . . 72.2% was plastic
- 1978 . . . 66.9% was plastic
- 1979 . . . 69.8% was plastic
- 1980 . . . 78.0% was plastic
- 1981 . . . 84.2% was plastic
- 1982 . . . 79.9% was plastic
- 1983 . . . 75.2% is projected to be plastic

Of the respondents, 9% said they used no plastic at all in their system. Of those who did use plastic, 81% said they used one type exclusively. PE 2306 was the favorite of those who used only one type, with 60% saying they used PE 2306 for all their plastic piping needs. PE 3406 was the favorite of 25% of the companies who used only one type, with the others split fairly equally between PE 3306, polybutylene, PVC I and II, Aldyl A, PESDR II, and Driscopipe.

Plastic is used for mains and services by 97.5% of plastic users: 1.25% said they used plastic for mains but not services, and 1.25% said they used plastic for services but not mains. Plastic gas grill lines are used by 25% of plastic users, 16.5% say they use plastic for outdoor gas lights, and 6% say they use plastic for irrigation services. Another 10% of the companies say they have other uses as well for plastic, including inserts of iron mains and services, vents, and swimming pool heater lines.

Of the 18,863.6 miles of plastic pipe installed in 1982 by gas utilities, 47.2% was 1-in. or less. Another 35.5% was 1¼ to 2-in., 8.2% was 3-in., 7% was 4-in., and 2.1% was greater than 4-in. In 1983, projections are for 49.3% to be 1-in. or less; 32.8% will be 1¼ to 2-in.; 8.6% will be 3-in.; 7.9% will be 4-in.; and 1.4% will be larger than 4-in.

## Plastic Vs. Steel

In the survey, respondents were asked if they used more plastic now than before, or more steel, and the reasons. The responses included:

"We have standardized on plastic pipe for mains and services 3-in. and smaller and 60 psi and less for the past 10 years."

"PE pipe is cheaper to buy, install, and maintain."

"We are using less steel and more plastic for economic reasons and easier construction. Use of plastic pipe results in lower requirements for side boom and hoist, fewer weldors, and no cathodic protection."

"About 50-50."

"More plastic is being used in the system because of corrosion requirements and cheaper labor costs."

"Haven't used any plastic pipe but feel that we may be forced to because steel is so high priced."

"Except for higher pressure and larger pipe size, we are using 100% plastic."

"We use all poly pipe, eliminates cathodic protection."

"We are using more plastic, mainly for corrosion protection reasons."

"Use of plastic pipe has increased efficiency of crews. It is lighter and easier to handle, and therefore requires less heavy equipment."

"More plastic, easier installation."

**P&GJ**

### Size Of Plastic Pipe Installed By Gas Distribution Utilities

| Size (inches) | % Total 1980 | % Total 1981 | % Total 1982 | % Total est. 1983 |
|---|---|---|---|---|
| 1 and under | 50.3 | 50.5 | 49.3 | 49.3 |
| 1¼ to 2 | 40.1 | 38.4 | 38.6 | 32.7 |
| 3 | 2.9 | 3.6 | 3.8 | 8.6 |
| 4 | 5.6 | 5.4 | 6.1 | 8.0 |
| 6 and over | 1.1 | 2.1 | 2.2 | 1.4 |

### 1982 Gas Distribution Utility Usage Of Plastic Pipe

| Type Of Installation | % Of Total |
|---|---|
| New mains | 24.3 |
| Replacement mains | 22.6 |
| New Services | 26.1 |
| Replacement Services | 26.5 |
| Other applications | 0.5 |

# Future World LNG Trade Looks Good — Part 2

**by P. J. Anderson,** *Consulting Editor, Technology*

## Projects Under Construction

Currently, two projects are under construction (Table 2). Both will deliver gas to Japanese customers. The first involves Malaysia where Malaysia LNG SDN. BHD., owned 65% by Petronas and 17.5% each by Shell and Mitsubishi, will export LNG to Tokyo Gas Co., Ltd., and The Tokyo Electric Power Co., Inc., beginning in January 1983. The second involves expansions of the two Indonesian LNG facilities. The LNG produced will be exported to Japanese customers beginning in 1984 for the expansion of the P.T. Badak facility in east Kalimantan and later in 1984 or early 1985 for the expansion of the P.T. Arun plant at Lho Seuawe, Sumatra.

With the implementation of these two projects and the achievement of full plateau volumes, the quantity of LNG in world trade will have increased to 6.67 Bcfd (65.4 billion $Nm^3$/yr). The volume directed toward Japan will have increased by two-thirds to a level of 3.79 Bcfd (37.2 billion $Nm^3$) or 57% of world trade. The share of projects directed toward Europe and the U.S. will have decreased proportionately.

## Possible Projects

There are a multitude of possible projects. Some will likely be implemented, although their forms could well be different than they are currently envisioned. Other projects are destined never to be implemented. To be implemented, a project needs, among many criteria, the following:

- Sufficient, dedicated reserves
- Favorable economics
- Long-term support of the buyer and seller
- Concurrence and support of the governments involved
- Approvals of governmental authorities with jurisdictional authority
- Acceptable financing.

Ten projects have been selected for inclusion in Table 3. A brief discussion of the status of each project follows.

**Australia-Japan.** Phase 2, the LNG phase, of the North West Shelf Project is to commence when firm gas purchase contracts are signed with the eight Japanese buyers. Since July 1981, negotiations to complete the individual sales and purchase agreements have proceeded in a rapidly changing economic climate, in both Australia and Japan. Against this background, sellers and buyers announced a new target date of April 1987 for supply of the North West Shelf LNG, building to plateau levels in 1990.

Because of the later target date for LNG delivery, North West Shelf participants have rescheduled construction of the LNG-related facilities. This, together with the results of further appraisal work on the North Rankin reservoir, has enabled the second platform to be deferred and design work, just beginning, was suspended so that the experience obtained on North Rankin A could be incorporated. Other major items that have been affected are the LNG plant at Withnell Bay and the acquisition of the seven 125,000 $m^3$ capacity LNG tankers to be used to transport the liquefied gas to Japan.

Project specifications for the LNG plants have been completed by SIPM in The Hague. Studies to define outline specifications for the LNG tankers have been finalized. Total cost of the project, including the seven LNG carriers that will be required, is now estimated to be $11 billion in as-expended dollars.

**Canada-Japan.** There are three competing projects to export Alberta and British Columbia surplus gas to Japan. The Western LNG Project is proposed by a consortium headed by Dome Petroleum Ltd., which includes Nova Corp., and NIC Resources Inc., a wholly-owned subsidiary of Nissho Iwai Corp. This proposal calls for the export of 3 Tcf of natural gas

**TABLE 2.**
**Under Construction Base-Load LNG Import Projects**

| Trade | Contract Initial Delivery | Contract Term, yr | Companies Involved | Daily Gas Volume, MMcf |
|---|---|---|---|---|
| **Malaysia — Japan**<br>Bintulu — Japanese Terminals | 1983 | 20 | Malaysian LNG<br>Petronas, Mitsubishi,<br>Shell, Tokyo Gas Co., Ltd.<br>Tokyo Electric Power Co., Ltd. | 870 |
| **Indonesia — Japan**<br>East Kalimantan — Japanese Terminals<br>(plant expansion) | 1984 | 20 | Pertamina<br>Osaka Gas Co., Ltd.<br>Toho Gas Co., Ltd.<br>Kansai Electric Power Co.<br>Chubu Electric Power Co. | 460 |
| **Indonesia — Japan**<br>Arun — Japanese Terminals<br>(plant expansion) | 1984-5 | 20 | Pertamina<br>Tokyo Electric Power Co., Ltd.<br>Tohoku Electric Power Co. | 480 |

### TABLE 3.
### Possible Base-Load LNG Import Projects

| Trade | Contract Initial Delivery | Contract Term, yr | Companies Involved | Daily Gas Volume, MMcf |
|---|---|---|---|---|
| **Australia — Japan**<br>Witnnell Bay-<br>Japanese Terminals | 1987 | — | Woodside Group<br>Eight Japanese Terminals | 850 |
| **Western LNG**<br>(British Columbian Gas<br>and Alberta Gas)<br>British Columbia — Japan | 1986 | 20 | Dome Petroleum Ltd.<br>NIC Resource Inc.<br>Chubu Electric Power Co.<br>Chugoku Electric Power Co., Inc.<br>Kyushu Electric Power Co., Inc.<br>Osaka Gas Co. Ltd.<br>Toho Gas Co. | 400 |
| **Thailand — Japan/Korea**<br>Songkhla-Japanese or<br>Korean Terminals | — | — | Texas Pacific Thailand Inc.<br>PSA Group<br>Thai Government<br>Japanese Trading Co. | 250 |
| **Qatar — Japan** | 1988 | 20 | Qatar General Petroleum Co.<br>International Petroleum Co.<br>Japanese Trading Co. | 870 |
| **U.S.S.R. — Japan**<br>Sakhalin Island —<br>Japanese Terminals | 1986 | 20 | Soviet Union<br>Sakhalin Oil Development<br>Cooperation Co. | 435 |
| **Indonesia — Korea**<br>Arun — Pyongtack | 1987 | 20 | Pertamina<br>Korean Electric Power Corp. | 210 |
| **Cameroons — Europe**<br>Kribi-European Terminals | 1987-89 | 20 | SOGAZCAM<br>European Buyers | 420 |
| **Canada — Europe/E. Canada**<br>(Arctic Pilot Project)<br>Bridport Inlet, Melville<br>Island — European or<br>Eastern Canadian Terminals | 1987 | 20 | Petro-Canada<br>Dome Petroleum Ltd.<br>Nova<br>Melville Shipping Ltd.<br>TransCanada Pipelines Ltd.<br>(Receiving Terminal) | 260 |
| **Canada — Europe**<br>King Christian Island and<br>Ellef Ringnes Islands-<br>European Terminals | 1990 | 20 | TransCanada PipeLines<br>Petro-Canada<br>Ruhrgas A.G.<br>Gelsenberg A.G. | 510 |
| **Nigeria — Europe/U.S.** | 1989 | — | National Nigerian<br>Petroleum Corp.<br>Shell Gas B.V., Agip Africa,<br>Cie. Elf-Aquitain | 840 |

over a 20-year period starting in 1986 to five Japanese utility companies. This project has received the support of the B.C. Provincial Government.

On the Federal level, the National Energy Board began hearings under Phase II of the Omnibus Hearings on Natural Gas Exports. Under consideration are export license applications of some 16 companies totaling 26 Tcf. Included are LNG exports to Japan. Selection of the successful applications is expected later this year or early next year.

**Thailand-Japan.** After over a year of pressure by proponents of gas exports, the Cabinet of Prime Minister Prem Tinsulanond's government has agreed in principle to export approximately 220 MMcfd (2.2 billion Nm$^3$/yr) of gas from the Gulf of Thailand. Japanese utility companies are the most likely customers; some gas could go to Korean buyers. No announcements of sales agreements have been made. The quantity approved as surplus to Thailand's needs, and available for export, was only half of the 440 MMcfd (4.4 billion Nm$^3$) proposed by Texas Pacific Thailand Inc. and PSA Group (a diversified Thai company). The gas-export project, as originally proposed by TP and PSA, was to export the gas from TP's "B" Structure gas complex in Block 15.

The TP-PSA proposal was to bring the gas ashore by a 125-mile subsea pipeline to a liquefaction plant near Songkhla. The gas would be liquefied at a two-train plant and exported. Based on averaged shipping distances, a four-vessel fleet of 120,000 m$^3$ capacity would be indicated.

**Qatar-Japan/Europe.** Development of a gas export project would involve production from the offshore North field. According to a DeGolyer & MacNaughton estimate, North field's reserves could be as large as 298 Tcf (8 trillion m$^3$), some three times the reserves of the Groningen field and, more importantly, almost 10 times Qatar's oil reserves.

Financial and technical proposals have been submitted by six companies competing for a 15% operating partnership in the project. Japanese trading companies would compete for an additional 5% share of the project. Qatar General Petroleum Corp. will hold the remaining 80% of the operating partnership.

The project, as originally planned, called for export of a projected 870 MMcfd (8.5 billion Nm$^3$/yr) to Japan beginning in about 1987. Exports would be for 25 years. Resistance from the trading companies to such a large volume in the Japanese market in that time frame has been reported. Consequently, the volume may be reduced or partially redirected to European buyers.

**Russia-Japan.** Timetable for developmental drilling offshore Sakhalin Island could be seriously affected if the U.S. maintains its sanctions against use of American technology in Soviet energy projects. Involved is a U.S. ban on use of electrical logging equipment made by Schlumberger and pipe guiding equipment now being used at two platforms drilling exploratory wells on the continental shelf on the Sea of Okhotsk.

The Sakhalin Oil Development Cooperation Co., a consortium involving government-owned Japan National Oil Corp. and 18 private companies, wants the ability to renew a $1.2 million lease to use the equipment covered by the sanctions plus the ability to purchase the required spare parts. U.S. enforcement of the ban could delay developmental drilling by up to two years.

Reserves in the area are presently estimated to be 250 million bbl of oil and 5 Tcf of gas. Under the agreement, about 70,000 bbl of oil per year, beginning in 1986, and 435 MMcfd (4.1 billion Nm$^3$/yr) of gas as LNG, beginning in 1988, are to be imported by the consortium.

**Indonesia-Korea.** A decision to import LNG was made by the Korean government in October 1980. Korean Electric Power Corp. will sponsor the project. Korea's LNG import project is reportedly to be developed in phases. The first phase, beginning in 1985, will involve the import of 210 MMcfd (2.1 billion Nm$^3$/yr) from Pertamina's Indonesian

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facilities. The second phase, beginning in 1987, would involve increased imports of 420 MMcfd (4.1 billion Nm$^3$/yr). A potential third phase, beginning in the late 1980's or early 1990's, would increase imports to a level of 530 MMcfd (6.2 billion Nm$^3$/yr).

Initial LNG imports would be used primarily by KECO for electric power generation. Any remaining gas would be distributed in the Seoul and Inchon areas.

LNG for the first phase would come from a one-train expansion at Pertamina's P.T. Arun facility. A one-train expansion would provide a nominal 178 MMcfd (1.75 billion Nm$^3$/yr) of gas as LNG.

**Cameroons-Europe.** Although proven recoverable reserves may be less than originally projected, 3.7 to 4.1 Tcf (100 to 110 billion Nm$^3$), the government is understood to be actively supporting development of an LNG export project. A consortium, Segazcam, has been formed of the State Oil Company, Societe National des Hydrocarbures (SNH), and a group of petroleum companies with gas reserves: Elf-Aquitain, Pectin, Mobil, and Total. Based on the revised reserves figures, a project of approximately 420 MMcfd (4.1 billion Nm$^3$/yr) would appear to be supportable. Targeted date for project implementation is 1987-89. The Tealarc mixed-refrigerant precooled cycle has been selected for the proposed plant near Kribi in southern Cameroons. Majority of the gas export is to come from the northern part of the country near Victoria and the remainder from fields near Kribi.

**Canadian Arctic-Europe.** The consortium of companies forming the Arctic Pilot Project (APP) may be shifting its market – for the planned 260 MMcfd (2.6 billion Nm$^3$/yr) project from Melville Island in the Arctic – from Eastern Canada/United States to Europe. Talks are ongoing with potential customers in France and Germany. It should become clear which market the project, slated for implementation in 1987, will serve by the end of the year. U.S. buyers are opposed to exporting the gas to Europe, claiming first right of refusal.

Hearings before NEB have been adjourned on the project pending resolution of its market.

An April 19 announcement disclosed a joint venture to develop a project to export high Arctic Island gas to Europe. Participants include TransCanada PipeLines, Petro-Canada, Ruhrgas AG, and Gelsenberg AG. Interest is held on a 33⅓% basis for each of the two Canadian partners, while the German partners share the remaining 33⅓%.

The project, as currently envisioned, would involve producing and gathering of gas from several gas fields on and around King Christian and Ellef Ringnes Islands, about 800 miles above the Arctic Circle. LNG would be liquefied and shipped some 4100 miles in Arctic Class 10 vessels of a nominal 130,000 m$^3$ capacity to Wilhelmshaven, Germany, where Deutsche Flussigerdgas Terminal GmbH's receiving terminal will be located. Volume of gas to be exported will be approximately 5[illegible] MMcfd (5 billion Nm$^3$/yr). A 20-year contract period is indicated with the price being competitive with and escalation tied to the price of competing fuels in Europe. Scheduling of project implementation is set for about 1990. Cost of the project is estimated at $C4 billion.

**Nigeria-Europe/United States.** Dissolution of Bonny LNG Ltd., because of withdrawal of Phillips Petroleum Worldwide Gas Ltd. and B.P. Africa Gas Co., was a disappointment even if not totally unexpected. The remaining former partners, Shell Gas B.V., Agip (Africa) and Cie. Elf-Aquitain du Gaz, and the Nigerian National Petroleum Corp. are attempting to structure a new project.

The new project, with a targeted date of 1989 quite possible, would be about 840 MMcfd (8.2 billion Nm$^3$/yr) or half the size of the Bonny project. The Nigerian government has undertaken a study to define that project. Its results are to be delivered to the government by year's end. Action on a project could be expected shortly thereafter. **P&GJ**

# Foreign Operations Curb Profits

by Cindy Mays, *Assistant Editor, Energy Management Report*

Despite a strong showing by U.S. refining and marketing operations, the 73 oil companies responding to our survey report a 19.1 percent drop in earnings for the third quarter. Profit margin for the group fell from 6.7 percent to 5.4 percent.

Once again, those companies with a major stake in U.S. petroleum operations posted substantial increases in net income this quarter as illustrated in the 84 percent rise at Amerada Hess.

Ashland Oil's 54 percent jump was due primarily to lower priced domestic sources for crude oil, accounting for 70 percent of their refining needs, compared to 58 percent last year.

Earnings at Atlantic Richfield rose 3 percent as a result of sharply increased earnings in petroleum refining and marketing, oil production from Alaska's Kuparuk River field, and higher natural gas prices.

The combination of improved margins in Union Oil of California's refining and marketing activities and decreased dry hole and exploration expenses sent their earnings up 10.3 percent.

Aramco members, on the other hand, were hurt by their agreement to buy $34/bbl Saudi oil.

Exxon's third quarter earnings dropped 25 percent; Mobil, 36 percent; Texaco, 49 percent; and Standard Oil of California, 13 percent.

Among the major oil companies surveyed, Gulf Oil reported the biggest decline at 54 percent. The largest contributing factor was a pretax write-down of more than $100 million on chemical properties.

Standard Oil of Ohio posted a 4 percent gain in net income. Results from the company's exploration and production, and marketing and refining operations offset losses in coal, chemicals, and industrial products.

Lower crude oil prices and slumping natural gas demand overshadowed higher U.S. gas prices, resulting in a 28 percent drop in earnings at Sun Co. and a 6.1 percent decline at Shell Oil.

Pennzoil earnings were adversely affected by sharply reduced pipeline purchases of natural gas, dropping 17 percent.

Cities Service 67.8 percent decline was due mostly to an after-tax increase of $36 million in exploration costs and interest expense.

Continued pressure on refined product margins, lower crude oil and free market natural gas prices, and a soft coal market caused Dorchester Gas earnings to drop 43.1 percent.

American Petrofina's net income fell 41.4 percent because higher charges attributable to the company's expanded exploration program caused operating income from exploration and production activities to decline.

Lower demand for natural gas and related services contributed to the 8.5 percent decline in third quarter earnings for the 27 gas companies in our survey group. Profit

GAS COMPANIES THIRD QUARTER FINANCIAL REPORTS

| | Three months ending September 30 | | | | | | Nine months ending September 30 | | | | | | Profit Margin | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Revenues ($000) | | | Earnings ($000) | | | Revenues ($000) | | | Earnings ($000) | | | | |
| Company | 1982 | 1981 | % Chg. | 1982 | 1981 | % Chg. | 1982 | 1981 | % Chg. | 1982 | 1981 | % Chg. | 1982 | 1981 |
| Alabama Tennessee NG | 29,582 | 25,413 | + 16.4 | 1,329 | 1,184 | + 12.3 | 96,596 | 86,542 | + 11.6 | 4,316 | 4,135 | + 4.4 | 4.5 | 4.8 |
| Am. Nat. Resources | 528,328 | 529,022 | - 0.1 | 17,756 | (109) | | 2,275,009 | 2,008,168 | + 13.3 | 113,337 | 70,485 | + 60.8 | 5.0 | 3.5 |
| ARKLA | 274,586 | 254,726 | + 7.8 | 12,435 | 12,118 | + 2.6 | 1,262,669 | 1,137,030 | + 11.0 | 93,600 | 85,463 | + 9.5 | 7.4 | 7.5 |
| Coastal Corp. | 1,324,087 | 1,408,797 | - 6.0 | 21,224 | 1,827 | + 1061.5 | 4,236,378 | 4,594,905 | - 7.8 | 43,048 | (22,328) | | 1.0 | |
| Columbia Gas | 793,086 | 713,683 | + 11.1 | (24,725) | (148) | | 3,662,901 | 3,075,173 | + 19.1 | 110,494 | 118,912 | - 7.1 | 3.0 | 3.9 |
| Consolidated NG | 498,136 | 360,007 | + 38.4 | 6,237 | 931 | + 569.9 | 2,327,315 | 1,927,567 | + 20.7 | 118,109 | 94,320 | + 8.2 | 5.1 | 4.9 |
| El Paso Cos. | 954,794 | 962,239 | - 0.8 | 26,773 | 39,172 | - 31.6 | 2,845,181 | 2,781,403 | + 2.3 | 66,162 | 107,848 | - 38.6 | 2.3 | 3.9 |
| ENSERCH | 968,317 | 853,113 | + 13.5 | 31,300 | 41,613 | - 24.8 | 2,974,242 | 2,509,521 | + 14.5 | 124,553 | 143,733 | - 13.3 | 4.3 | 5.7 |
| Equitable Gas | 62,936 | 52,113 | + 20.8 | 2,034 | 1,718 | + 18.4 | 418,480 | 407,164 | + 2.8 | 37,100 | 39,904 | - 7.0 | 8.9 | 9.8 |
| Houston NG[1] | 728,328 | 800,617 | - 9.0 | 56,630 | 63,149 | - 5.6 | 3,180,718 | 2,906,310 | + 9.4 | 262,290 | 238,248 | + 10.1 | 8.2 | 8.2 |
| InterNorth | 806,249 | 741,606 | + 8.7 | 13,978 | 27,768 | - 49.7 | 2,980,459 | 2,622,201 | + 13.6 | 142,074 | 183,435 | - 22.5 | 4.8 | 7.0 |
| Kansas-Nebraska NG | 109,961 | 109,522 | + 0.4 | 4,064 | 6,971 | - 41.7 | 355,129 | 319,162 | + 11.3 | 17,936 | 18,663 | - 3.9 | 5.1 | 5.9 |
| Northwest Energy | 218,311 | 220,177 | - 0.8 | (4,163) | 11,975 | | 1,002,318 | 924,412 | + 8.4 | 31,108 | 50,099 | - 37.9 | 3.1 | 5.4 |
| ONEOK Inc. | 206,758 | 240,380 | - 14.0 | 7,779 | 10,599 | - 26.6 | 833,198 | 835,307 | - 0.3 | 41,554 | 46,440 | - 10.5 | 5.0 | 5.6 |
| Pacific Lighting[2] | 1,027,115 | 801,550 | + 28.1 | 22,490 | 27,059 | - 16.9 | 3,208,272 | 2,395,361 | + 33.9 | 83,738 | 98,328 | - 14.8 | 2.6 | 4.1 |
| Panhandle Eastern | 758,893 | 741,846 | + 2.3 | 48,544 | 56,181 | - 13.6 | 2,511,390 | 2,463,025 | + 1.9 | 184,508 | 212,940 | - 13.4 | 7.3 | 8.6 |
| Peoples Energy | 1,542,490 | 1,315,617 | + 17.2 | 45,952 | 48,210 | - 4.7 | 151,172 | 161,500 | - 6.4 | (12,293) | (8,512) | | | |
| Pioneer Corp. | 308,938 | 310,952 | - 0.6 | 26,077 | 27,399 | - 4.8 | 866,157 | 907,129 | - 4.5 | 72,556 | 84,998 | - 14.6 | 8.4 | 9.4 |
| Sonat Inc. | 563,054 | 598,891 | - 6.4 | 48,304 | 38,209 | + 26.4 | 1,990,098 | 1,900,956 | + 4.7 | 160,640 | 129,029 | + 24.5 | 8.1 | 6.8 |
| Southern Union | 223,408 | 220,122 | + 1.5 | (1,471) | 69 | | 817,318 | 777,587 | + 5.1 | 12,872 | 27,901 | - 53.9 | 1.6 | 3.6 |
| Texas Eastern | 1,315,003 | 1,110,982 | + 18.4 | 43,275 | 45,521 | - 4.9 | 4,151,625 | 3,283,496 | + 26.4 | 147,952 | 164,434 | - 10.0 | 3.6 | 5.0 |
| Texas Gas Trans. | 650,800 | 610,900 | + 6.5 | 25,556 | 32,862 | - 21.9 | 2,107,385 | 1,884,414 | + 11.8 | 83,869 | 102,703 | - 18.3 | 4.0 | 5.5 |
| TransCanada PipeLines | 752,045 | 721,371 | + 4.3 | 49,633 | 38,758 | + 28.1 | 2,567,188 | 2,479,442 | + 3.5 | 138,931 | 103,072 | + 34.8 | 5.4 | 4.2 |
| Transco | 927,654 | 807,898 | + 14.8 | 30,447 | 28,587 | + 6.5 | 2,808,429 | 2,578,466 | + 8.9 | 108,302 | 91,057 | + 18.9 | 3.9 | 3.5 |
| United Energy Res. | 1,290,193 | 1,389,606 | - 7.2 | 40,634 | 49,632 | - 18.1 | 4,245,722 | 3,925,656 | + 8.2 | 159,080 | 158,944 | + 0.1 | 3.7 | 4.0 |
| Westcoast Trans. | 151,461 | 200,138 | - 41.8 | 20,702 | 14,998 | + 38.0 | 791,326 | 906,426 | - 12.7 | 58,449 | 48,661 | + 20.1 | 7.4 | 5.4 |
| TOTALS | 17,014,518 | 16,161,288 | + 5.3 | 572,864 | 626,253 | - 8.5 | 54,563,675 | 49,798,432 | + 9.6 | 2,403,557 | 2,392.912 | + 0.4 | 4.4 | 4.8 |

[1] Three months and twelve months ended July 31. [2] Twelve months.

## OIL COMPANIES THIRD QUARTER FINANCIAL REPORTS

| Company | Three months ending September 30** | | | | | | Nine months ending September 30** | | | | | | Profit‡ Margin | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Revenues ($000) | | | Earnings* ($000) | | | Revenues ($000) | | | Earnings* ($000) | | | | |
| | 1982 | 1981 | % Chg. | 1982 | 1981 | % Chg. | 1982 | 1981 | % Chg. | 1982 | 1981 | % Chg. | 1982 | 1981 |
| Adobe O&G Corp. | 51,202 | 48,213 | + 6.2 | 5,761 | 6,060 | - 4.9 | 154,944 | 133,317 | + 16.2 | 17,490 | 18,000 | - 2.8 | 11.3 | 13.5 |
| Amerada Hess | 2,124,094 | 1,903,170 | + 11.6 | 80,127 | 43,523 | + 84.1 | 6,277,671 | 7,104,206 | - 11.6 | 125,049 | 164,343 | - 23.9 | 2.0 | 2.3 |
| American Petrofina | 540,121 | 610,747 | - 11.6 | 12,696 | 21,650 | - 41.4 | 1,723,328 | 1,990,945 | - 13.4 | 39,566 | 57,151 | - 30.8 | 2.3 | 2.9 |
| Argo Petroleum | 5,975 | 4,956 | + 20.6 | (2,128) | 555 | | 17,004 | 16,110 | + 5.6 | (3,538) | 2,073 | | | 12.9 |
| Ashland Oil | 8,864,669 | 9,262,076 | - 4.3 | 30,057 | 26,502 | + 13.4 | 2,212,229 | 2,526,114 | - 91.2 | 75,819 | 49,279 | + 53.9 | 3.4 | 2.0 |
| Asamera | 114,662 | 119,527 | - 4.1 | 977 | 2,542 | - 61.6 | 321,892 | 338,347 | - 4.9 | (867) | 6,692 | | | 2.0 |
| Atlantic Richfield | 6,795,462 | 7,076,365 | - 3.9 | 446,884 | 433,532 | + 3.0 | 20,245,850 | 21,397,558 | - 5.4 | 1,242,071 | 1,201,472 | + 3.4 | 6.1 | 5.6 |
| Beard Oil | 8,065 | 9,013 | - 10.5 | (885) | 1,356 | | 26,898 | 25,280 | + 6.4 | (250) | 3,851 | | | 15.2 |
| Belco Petroleum | 84,352 | 77,454 | + 8.9 | 25,230 | 24,088 | + 4.7 | 246,037 | 234,765 | + 4.8 | 76,265 | 71,984 | + 5.9 | 31.0 | 30.7 |
| Callon Petroleum[1] | 5,371,390 | 3,136,060 | + 71.3 | 57,471 | 376,912 | - 84.7 | 16,708,000 | 9,291,305 | + 79.8 | 2,075,078 | 2,610,406 | - 20.5 | 12.4 | 28.1 |
| Cities Service | 1,962,400 | 1,910,900 | + 2.7 | 25,000 | 77,600 | - 67.8 | 5,853,100 | 5,781,400 | + 1.2 | 152,700 | 225,800 | 32.4 | 2.6 | 3.9 |
| Commonwealth Oil Refining | 21,900 | 258,200 | - 91.5 | (5,900) | (20,600) | | 288,100 | 809,400 | 64.4 | (22,100) | (83,000) | | | |
| Consolidated O&G | 9,092 | 12,214 | - 25.6 | (1,469) | 2,015 | | 30,648 | 36,564 | - 16.2 | (3,781) | 5,708 | | | 15.6 |
| Crown Central | 464,815 | 316,196 | + 47.0 | 8,365 | (5,189) | | 1,304,449 | 1,074,809 | + 21.4 | 2,418 | (11,503) | | 0.2 | |
| Crystal Oil | 46,798 | 82,674 | - 43.4 | 1,670 | 1,219 | + 37.0 | 152,924 | 227,826 | - 32.9 | (232) | 274 | | | 0.1 |
| Diamond Shamrock | 733,196 | 820,569 | - 10.6 | 42,272 | 54,401 | - 22.3 | 2,422,040 | 2,503,667 | - 3.3 | 103,347 | 170,423 | - 39.4 | 4.3 | 6.8 |
| Dorchester Gas | 1,159,101 | 712,033 | + 62.8 | 17,812 | 31,287 | - 43.1 | 353,571 | 230,842 | + 53.2 | 4,034 | 7,704 | 47.6 | 1.1 | 3.3 |
| Dyco Petroleum | 15,152 | 12,647 | + 19.8 | 4,104 | 3,819 | + 7.5 | 43,699 | 35,423 | + 23.4 | 11,935 | 10,368 | + 15.1 | 27.3 | 29.3 |
| Engle Exploration[2] | 965 | 212 | +355.2 | (236) | (50) | | 1,444 | 415 | +248.0 | (761) | (120) | | | |
| Energy Reserves Group | 39,743 | 43,176 | - 7.9 | (4,859) | (4,637) | | 121,928 | 129,741 | - 6.0 | (1[illegible],509) | (146) | | | |
| Enstar Corp. | 82,810 | 88,375 | - 6.3 | 11,461 | 8,525 | + 34.4 | 262,317 | 259,983 | + 0.9 | 30,928 | 32,755 | - 5.5 | 11.8 | 12.6 |
| Equity Oil | 5,583 | 6,318 | - 11.6 | 198 | 1,393 | - 85.8 | 17,340 | 18,759 | - 7.6 | 1,904 | 4,280 | - 55.5 | 11.0 | 22.8 |
| Exxon | 25,331,000 | 27,614,000 | - 8.6 | 1,070,000 | 1,075,000 | - 0.5 | 77,394,000 | 85,406,000 | - 9.4 | 3,195,000 | 4,500,000 | - 29.0 | 4.1 | 5.3 |
| Felmont Oil Corp. | 18,795 | 20,046 | - 6.2 | 3,898 | 3,762 | + 3.6 | 58,022 | 56,271 | + 3.1 | 11,031 | 12,395 | - 11.0 | 19.0 | 22.0 |
| Forest Oil Corp. | 40,194 | 37,818 | + 6.3 | 4,660 | 369 | +1162.9 | 116,055 | 103,812 | + 11.8 | 9,900 | 3,597 | +175.2 | 8.5 | 3.5 |
| Freeport McMoRan | 186,137 | 202,834 | - 8.2 | 19,748 | 36,782 | - 46.3 | 556,057 | 635,650 | - 12.5 | 61,081 | 128,405 | - 52.0 | 11.1 | 20.2 |
| Galaxy Oil | 3,829 | 3,552 | + 7.8 | (542) | 64 | | 10,704 | 11,133 | - 3.8 | (1,954) | 371 | | | 3.3 |
| General American | 85,948 | 94,579 | - 9.1 | 16,299 | 20,911 | - 22.1 | 256,036 | 268,753 | - 4.7 | 47,819 | 45,564 | + 4.9 | 18.7 | 17.0 |
| Getty Oil | 3,083,766 | 3,267,550 | - 5.6 | 177,854 | 204,931 | - 13.2 | 9,286,618 | 9,778,720 | - 5.0 | 492,763 | 639,636 | - 23.0 | 5.3 | 6.5 |
| Gulf Energy & Dev. | 29,218 | 14,299 | +104.3 | 2,306 | 1,777 | + 29.8 | 63,393 | 42,480 | + 49.2 | 3,794 | 5,067 | - 25.1 | 6.0 | 11.9 |
| Gulf Oil Corp. | 7,538,000 | 7,439,000 | + 1.3 | 146,000 | 316,000 | - 53.8 | 22,502,000 | 22,526,000 | - 0.1 | 623,000 | 930,000 | - 33.0 | 2.8 | 4.1 |
| Hamilton Bros. Petroleum | 37,197 | 42,797 | - 13.1 | 4,520 | 3,070 | + 47.2 | 126,147 | 105,937 | + 19.1 | 8,863 | 12,444 | - 28.8 | 7.0 | 11.7 |
| Harken O&G | 1,481 | 1,161 | + 27.6 | 98 | 33 | +197.0 | 4,109 | 2,950 | + 39.3 | (677) | (952) | | | |
| Holly Corp.[3] | 153,895 | 99,515 | + 54.6 | (2,150) | (1,495) | | 435,373 | 289,644 | + 50.3 | 5,071 | 274 | +1750.7 | 1.2 | 0.1 |
| Howell Corp. | 53,303 | 55,591 | - 4.1 | 356 | (902) | | 184,065 | 167,168 | + 10.1 | 1,909 | (1,097) | | 1.0 | |
| Howell Petroleum | 13,234 | 21,366 | - 38.1 | 1,493 | 1,802 | - 17.1 | 56,931 | 66,195 | - 14.0 | 6,007 | 5,370 | + 11.9 | 10.6 | 8.1 |
| Inexco Oil | 51,535 | 61,525 | - 16.2 | 2,770 | 7,533 | - 63.2 | 170,061 | 176,117 | - 3.4 | 14,795 | 22,325 | - 33.7 | 8.7 | 12.7 |
| Lear Petroleum | 54,362 | 45,427 | + 19.7 | 1,520 | (840) | | 157,289 | 123,390 | + 27.5 | 253 | 2,601 | - 90.3 | 0.2 | 2.1 |
| Louisiana L&E | 259,144 | 313,805 | - 17.4 | 19,245 | 34,479 | - 44.2 | 873,873 | 934,748 | - 6.5 | 53,079 | 126,696 | - 58.1 | 6.1 | 13.6 |
| Mapco Inc. | 489,569 | 512,398 | - 4.5 | 20,236 | 11,332 | + 78.6 | 1,452,246 | 1,597,792 | - 9.1 | 54,127 | 66,776 | - 18.9 | 3.7 | 4.2 |
| Maynard Oil | 6,761 | 12,419 | - 45.6 | (340) | 1,746 | | 26,243 | 33,324 | - 21.2 | (989) | 5,675 | | | 17.0 |
| Mesa Petroleum | 99,709 | 103,810 | - 4.0 | 29,414 | 23,955 | + 22.8 | 303,667 | 308,346 | - 1.5 | 91,233 | 78,259 | + 16.6 | 30.0 | 25.4 |
| Mobil Corp. | 15,534 | 16,788 | - 7.5 | 323,000 | 506,000 | - 36.2 | 47,727 | 50,492 | - 5.5 | 959,000 | 1,846,000 | - 48.0 | 20.1 | 36.6 |
| Moran Energy | 20,864 | 25,412 | - 17.9 | 480 | 4,812 | - 90.0 | 74,253 | 74,371 | - 0.2 | 6,388 | 14,727 | - 56.6 | 8.6 | 19.8 |
| Murphy Oil | 641,018 | 531,867 | + 20.5 | 43,869 | 41,123 | + 6.7 | 1,983,925 | 1,858,694 | + 6.7 | 118,952 | 124,548 | - 4.5 | 6.0 | 6.7 |
| Natomas | 419,165 | 403,950 | + 3.8 | (43,817) | 67,926 | | 1,214,464 | 1,139,656 | + 6.6 | (52,367) | 183,720 | | | 16.1 |
| Noble Affiliates | 94,889 | 101,847 | - 6.8 | 17,718 | 21,918 | - 19.2 | 317,261 | 282,752 | + 12.2 | 60,403 | 58,309 | + 3.6 | 19.0 | 20.6 |
| Norris Oil | 696 | 726 | - 4.1 | 104 | (12 | | 2,033 | 2,056 | - 1.1 | 158 | (97) | | 7.8 | |
| Pacific Resources | 276,434 | 302,189 | - 8.5 | 4,441 | 6,085 | - 27.0 | 841,949 | 766,918 | + 9.8 | 2,925 | 7,498 | - 61.0 | 0.3 | 1.0 |
| Pennzoil Co. | 563,592 | 668,666 | - 15.7 | 52,488 | 46,445 | + 13.0 | 1,739,367 | 2,028,769 | - 14.3 | 135,210 | 163,549 | - 17.3 | 7.8 | 8.1 |
| Petrol Industries Inc. | 662 | 762 | - 13.1 | 141 | 213 | - 33.8 | 1,800 | 2,400 | - 25.0 | 373 | 720 | - 48.2 | 20.7 | 30.0 |
| Prairie Producing Co. | 6,500 | 8,268 | - 21.4 | 1,227 | 2,050 | - 40.1 | 20,031 | 22,636 | - 11.5 | 3,402 | 6,028 | - 43.6 | 17.0 | 26.6 |
| Phillips Petroleum | 4,002,333 | 3,895,148 | + 2.8 | 131,640 | 192,287 | - 31.5 | 11,845,172 | 12,196,572 | - 2.9 | 460,375 | 692,838 | - 33.6 | 3.9 | 5.7 |
| Quaker State | 245,542 | 251,660 | - 2.4 | 11,517 | 9,613 | + 19.8 | 718,789 | 689,736 | + 4.2 | 31,352 | 20,616 | + 52.1 | 4.4 | 3.0 |
| Sabine Corp. | 51,178 | 40,486 | + 26.4 | 5,423 | 6,679 | - 18.8 | 147,716 | 125,921 | + 17.3 | 21,433 | 22,714 | - 5.6 | 14.5 | 18.0 |
| Shell Oil | 5,090,000 | 5,578,000 | - 8.7 | 442,000 | 471,000 | - 6.1 | 15,037,000 | 16,545,000 | - 9.1 | 1,166,000 | 1,242,000 | - 6.1 | 7.7 | 7.5 |
| Southland Royalty | 86,803 | 100,758 | - 13.9 | 7,079 | 6,911 | + 2.4 | 274,551 | 301,085 | - 8.8 | 23,868 | 27,321 | - 12.6 | 8.7 | 9.1 |
| Southwestern Energy | 12,182 | 9,408 | + 29.5 | 1,608 | 1,717 | - 6.3 | 46,052 | 41,441 | + 11.1 | 8,439 | 9,569 | - 11.8 | 18.3 | 23.1 |
| Standard California | 8,666,000 | 11,458,000 | - 24.4 | 459,000 | 527,000 | - 12.9 | 28,056,000 | 34,425,000 | - 18.5 | 952,000 | 1,809,000 | - 47.4 | 3.4 | 5.2 |
| Standard Indiana | 7,676,000 | 7,957,000 | - 3.5 | 559,000 | 608,000 | - 8.1 | 22,399,000 | 23,949,000 | - 6.5 | 1,411,000 | 1,538,000 | - 8.3 | 6.3 | 6.4 |
| Standard Ohio | 3,175,000 | 3,704,400 | - 14.3 | 487,300 | 470,000 | + 3.7 | 9,387,400 | 10,106,500 | - 7.1 | 1,415,200 | 1,469,100 | - 3.7 | 15.1 | 14.5 |
| Sun Co. | 3,800,000 | 3,700,000 | + 2.7 | 152,000 | 210,000 | - 27.6 | 11,800,000 | 11,600,000 | + 1.7 | 386,000 | 628,000 | - 38.5 | 3.3 | 5.4 |
| Sundance Oil | 21,780 | 9,199 | +136.8 | (9,795) | (3,752) | | 72,894 | 22,523 | +223.6 | (8,095) | (7,040) | | | |
| Superior Oil | 499,823 | 499,785 | | 37,411 | 80,811 | - 53.7 | 1,536,394 | 1,496,872 | + 2.6 | 193,119 | 288,066 | - 33.0 | 12.6 | 19.2 |
| Tenneco | 3,780,976 | 3,621,310 | + 4.4 | 182,304 | 140,990 | + 29.3 | 11,559,295 | 11,293,076 | + 2.4 | 484,179 | 506,616 | - 4.4 | 4.2 | 4.5 |
| Texaco Inc. | 11,800,000 | 14,400,000 | - 18.3 | 303,000 | 589,000 | - 48.7 | 363,300,000 | 44,700,000 | - 18.9 | 975,000 | 1,803,000 | - 46.0 | 2.7 | 4.0 |
| Tosco Corp. | 901,970 | 900,655 | + 0.1 | 22,138 | 19,100 | + 15.9 | 2,552,219 | 2,529,999 | + 0.8 | 129,355 | 7,516 | + 16.2 | 5.1 | 0.3 |
| Total Petroleum N.A. | 553,224 | 583,401 | - 5.2 | 8,267 | (9,531) | | 1,649,284 | 1,725,600 | - 4.4 | 7,504 | (48,941) | | 0.5 | |
| Transcontinental Engy | 11,778 | 25,176 | - 53.2 | (2,278) | 2,826 | | 46,916 | 71,597 | - 34.5 | (5,010) | 7,863 | | | 11.0 |
| Union California | 2,771,700 | 2,908,300 | 4.7 | 212,800 | 193,000 | + 10.3 | 8,163,000 | 8,384,800 | - 2.6 | 578,900 | 555,400 | + 4.2 | 7.1 | 6.6 |
| Universal Resources | 13,926 | 16,837 | - 17.3 | 1,494 | 3,601 | - 58.5 | 45,518 | 46,425 | - 0.2 | 6,724 | 9,922 | - 32.2 | 14.8 | 21.4 |
| Wiser Oil | 13,073 | 14,339 | - 8.8 | 2,248 | 2,900 | - 22.5 | 40,913 | 47,506 | - 13.9 | 9,391 | 11,890 | - 21.0 | 23.0 | 25.0 |
| Woods Petroleum | 19,792 | 16,638 | + 19.0 | 4,864 | 4,523 | + 7.5 | 60,960 | 49,069 | + 24.2 | 16,535 | 13,264 | + 24.7 | 27.1 | 27.0 |
| TOTAL | 121,307,168 | 128,196,562 | - 5.4 | 5,290,664 | 6,541,772 | - 19.1 | 340,827,185 | 363,359,672 | - 6.2 | 18,319,244 | 24,448,108 | - 25.1 | 5.4 | 6.7 |

*Earnings available to common. **Excluding non-recurring items. ‡Profit Margin=Earnings ÷ Revenues. [1] Three months ending Aug. 31 with year ending May 31. [2] Fiscal year ends Sept. 30. [3] Ends April 30.

margin fell from 4.8 percent to 4.4 percent.

The depressed economy was blamed for United Energy Resources 18.1 percent decline.

The El Paso Company reported a 31.6 percent drop in net income due to the reduction in gas market demand, reduced margins and volumes on sales of chemical products, and higher interest expense.

Columbia Gas System posted a net loss this quarter due to depressed natural gas sales, and reduced System natural gas and oil production.

Reduced customer demand for gas, increases in uncollectible accounts, and inflation were among the factors causing Peoples Energy net earnings to fall 4.7 percent.

InterNorth's net income declined 49.7 percent because of recession-depressed wholesale natural gas and petrochemical results.

Kansas-Nebraska Natural Gas earnings were adversely affected by reduced gas sales to irrigation and industrial customers and a decline in activity by their pipeline construction unit.

Consolidated Natural Gas attributes their 569 percent gain in third quarter earnings to the increase in gas sales made to non-affiliated pipelines and utilities.

Coastal Corp. reported net income of $21.2 million this quarter compared to $1.8 million last year. The increase reflects improvement in refining and marketing during the third quarter. ■

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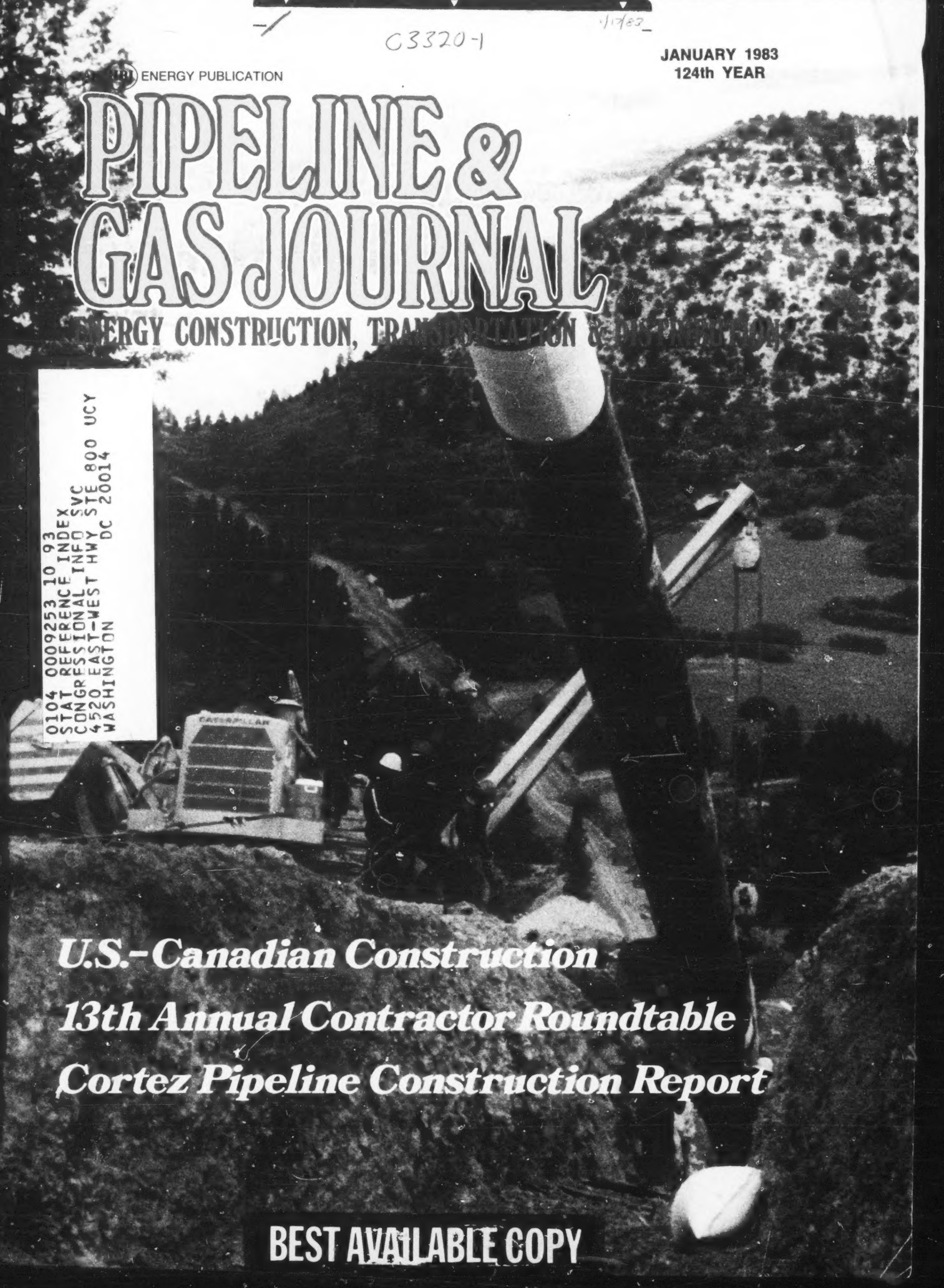

U.S.-Canadian Construction

13th Annual Contractor Roundtable

Cortez Pipeline Construction Report

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# PIPELINE & GAS JOURNAL

*International Pipeline & Gas Utility Design, Construction & Operation*

*Published Continuously Since 1859*

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**Contractors Foresee Average Year In 1983; Upturn To Spur Activity ........ 17**

Most of the cross-country projects to be built in 1983 will be of small to medium-size; few major projects are contemplated now but major increase in economic activity could stimulate activity, say participants at P&GJ's 13th annual Contractors Roundtable; exclusive report provides details.

**International Contractors Expect To Be Busy As World Economy Revives .. 22**

During the next three years, the world's pipeline contractors (outside U.S. and Canada) expect to remain busy – and on into the 1990's... participants in P&GJ's International Contractor Roundtable say they expect changing energy supply and demand patterns to create demand for many new oil/gas pipelines.

**U.S., Canada Companies Planning Nearly 47,000 Miles of New Lines ........ 28**

There are currently some 30,300 miles of new oil, gas, products, slurry, and $CO_2$ pipelines planned for the U.S. and 16,629 miles planned for Canada; projected construction totals are for 9412 miles in the U.S. and 1600 miles in Canada.

**U.S. Pipeline Projects – Planned and Proposed .................. 30**

Tables of currently planned and proposed crude oil, refined products, gas liquids and LPG, natural gas, carbon dioxide, and coal slurry pipelines in the U.S.

**Cortez $CO_2$ Line Masterpiece Of Planning, Innovations ............... 36**

When completed it will be the longest (505 miles), largest (30-in.), largest capacity (up to 1 Bcf per day), and, according to its builders, the heaviest, thanks to use of extra-heavy wall pipe – and it is loaded with new ideas in construction methods and equipment.

**Long Range Weather Outlooks Have Good Performance Record ......... 50**

**Gas Turbines Operate Successfully On Crude .................. 54**

Two large gas turbines used to drive pumps on crude oil line in North Africa have successfully operated on oil taken directly from the pipeline; in the Middle East, another 18 turbines are also operating on crude oil.

**What's New In Construction Equipment .. 55**

**Over-Capacity, Energy Policy Will Lessen Canadian Activity ........... 58**

Two years of intensive big-inch pipeline construction have created an over-capacity in Canada that is expected to trim 1983 pipeline construction to some bare minimums; even so, some major projects continue to be studied and advanced toward the construction stage.

**COVER**
Building pipelines up and down mountain slopes is tough and hazardous; Cherry Creek Hill, over 8000 ft elevation, was one of the highest points on the Cortez Pipeline and both pipe and equipment had to be winched up the steep incline.

*–photo courtesy Willbros Energy Services Co.*

# U.S., Canada Programs Plan For Nearly 47,000 Miles

**by Dean Hale,** *Editor,* **and Jim Watts,** *Assistant Editor*

Pipeline construction in the U.S. during 1983 is expected to be good, but certainly not spectacular, with many small and medium-size projects dominating activity, along with a healthy dose of oil and gas gathering lines in many areas.

A number of liquid and gas pipeline companies, responding to PIPELINE & GAS JOURNAL'S annual U.S. Pipeline Construction Survey, indicate that they have not yet firmed-up all of their plans for 1983. Much depends on the extent and rate of economic recovery – and the level of interest rates through the year. A growing economy, greater industrial activity, and attractive interest rates could provide a healthy boost to pipeline construction plans.

As of January 1, 1983, the number of pipeline projects planned and proposed in the U.S. totalled 30,309 miles. During 1983, an anticipated 9412 miles of new lines will be installed, including 4540 miles of oil and gas gathering lines and 4872 miles of trunk pipelines, according to P&GJ's survey.

Total of all planned and proposed projects in the U.S. and Canada is 46,938 miles. Canada, which experienced a record year in 1982 on big-inch pipeline construction, has only a few minor big-inch jobs slated for 1983 and most work will be small-inch laterals and oil/gas gathering line construction, totalling about 1600 miles *(see related article this issue).*

The 11,012 miles of new pipelines forecast for 1983 construction is less than that projected for 1982, reflecting the crosscurrents of the 1982 recession and their effect on all areas of the energy business – including pipelines.

## Gas Pipelines

Over 1800 miles of big-inch pipelines built in 1982 – wrapped up in three major natural gas projects including Northern Border (270 miles), Trailblazer (790 miles), and Red River Pipeline (360 miles) plus the 400-mile Arco Sheep Mountain $CO_2$ pipeline – skimmed the cream from the top of the pipeline project list for the present.

Quite a few other gas pipeline projects remain on the planning boards, but it is difficult to pinpoint those that, with certainty, will see light of day in 1983. The Pathfinder Pipeline (Michigan Wisconsin Pipeline) involving 634 miles of 20 and 24-in. and costing $231 million, to transport Overthrust gas eastward, is still considered a prospect, as is the Rocky Mountain Pipeline Project, 610 miles of 34-in. to take gas from the same area to California.

Palo Duro Pipeline's proposed 240-mile, 24-in. parallel line from the Texas Panhandle to Sweetwater was postponed in 1982; new planning may see it built in 1983. In Louisiana, Faustina Pipeline plans to build 100 miles of 36-in. Florida Gas plans to install some 390 miles of 30-in. in numerous loops on its system, depending on settlement of litigation related to abandonment of its 24-in. line and sale to affiliate Transgulf Pipeline for use in products service.

Elsewhere, Panhandle Eastern Pipe Line is said to be planning some 160 miles of laterals and gathering lines; Colorado Interstate's program could embrace 300 miles of lines in 1983; Columbia Gas has plans for some 500 miles of various size lines, and Columbia Gulf Transmission is planning (with Natural Gas Pipeline Co. of America) 127 miles of offshore lines.

## Carbon Dioxide Pipelines

Shell Oil's Cortez Pipeline, 503 miles of 30-in. that will transport $CO_2$ from southwest Colorado fields to the Denver City, Tex., area, is about one-half complete and will be completed this summer. Shell also plans some 500 miles of $CO_2$ delivery lines in the Denver City area. Amoco Pipeline reportedly is still planning a 350 to 400-mile line from New Mexico into West Texas, plus some 700 miles of delivery lines. Shell reportedly also is planning some 246 miles of $CO_2$ lines in Louisiana and Mississippi. Mobil Oil is said to be planning a 225-mile trunk $CO_2$ line plus field delivery lines.

## Crude Oil Pipelines

Announcement in early December by Pacific Texas Pipeline Co. to build 1026 miles of 42-in. from Long Beach to Midland, Texas adds another dimension to the quest for overload transport in the U.S. for Alaskan and imported crude to inland points. Pacific Texas officials exude confidence and say the line will be built by 1986 at latest. Parallel competitor much farther north, the Northern Tier Pipeline, now controlled by Getty, has aimed its big guns at resolving the question of where the line will originate in the Port Angeles area. The 1491-mile, 40 and 42-in. line would terminate in Clearbrook, Minn. and also would transport Alaskan crude (plus imports) to inland and eastern refiners.

Other crude oil line prospects include the 290-mile, 16-in. Frontier Pipeline in Wyoming; Provident Energy's 204 miles of 16-in. in Arizona, and Four Corners Pipe Line's 300 miles of loops on its line from the Utah-Colorado-New Mexico-Arizona area to California.

## Products Lines

Continental Pipe Line Co. is reported planning a 90-mile, 6-in. line in Wyoming; Seagull Pipe Line has two spreads

## 1983 PIPELINE OUTLOOK

### Miles Planned or Proposed

| Type of Line | U.S. | Canada |
|---|---|---|
| Natural Gas | 10,684 | 13,604 |
| Crude Oil | 3,605 | 1,475 |
| Products | 2,978 | 700 |
| Slurry | 10,396 | 500 |
| $CO_2$ (Carbon Dioxide) | 2,646 | 350 |
| **TOTALS** | **30,309** | **16,629** |
| **GRAND TOTAL, U.S. AND CANADA** | | **46,938** |

### Projected Completion, Miles

| Type of Line | U.S. | Canada |
|---|---|---|
| Natural Gas | 3138 | |
| $CO_2$ | 600 | |
| Crude Oil | 614 | 1600 |
| Products | 520 | |
| Slurry | — | |
| Oil/Gas Gathering | 4540 | |
| **TOTALS** | **9412** | **1600** |
| **GRAND TOTAL, U.S. AND CANADA** | | **11,012** |

working on 121 miles of its planned 280-mile 6 and 8-in. system on the Texas Gulf Coast; Texas Eastman plans 53 miles between Tyler, Tex. and Shreveport, La., and Colonial Pipeline reportedly is still studying closely a 240-mile, 16-in. lateral from Augusta, Ga. to Charleston, S. C., and 190 miles of 36-in. between Baltimore and Linden, N.J.

Planned but uncertain as to start of construction are the Phillips/HTI/Mapco 820 miles of 10-in. from Williston, N.D. to Conway, Kan., and Transgulf Pipeline's 890-mile, 24-in. products system (conversion from gas pipeline) plus numerous laterals.

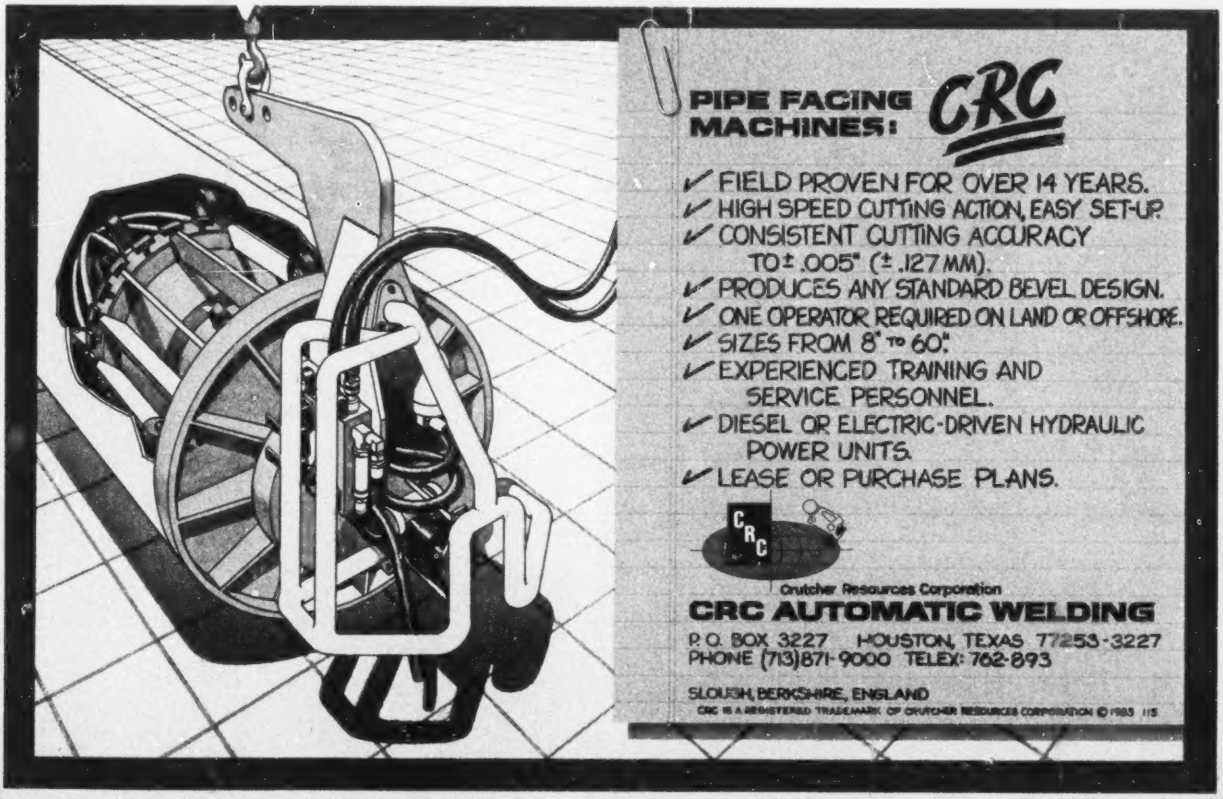
### Slurry Pipelines

Biggest question in this area is: when will Energy Transportation Systems Inc.'s 1440-mile, 40-in. line begin construction? "Starting" dates have continued to slip, and latest information is that contracts might be let in 1983 with work to begin in 1984. ETSI also has some 285 miles of water pipeline in South Dakota to build as an adjunct to the coal slurry line. ETSI will be a common carrier, and reportedly, getting shippers to sign up for available capacity has slowed events.

**P&GJ**

## U.S. — Natural Gas Pipelines

| Company | Miles | Size (In.) | From | To | Cost ($Millions) | Status | Contractors/Notes |
|---|---|---|---|---|---|---|---|
| Adobe Gas Co. | 80 | N/A | Toole, Liberty & Hill cos., Mont. | | | Planned | |
| Air Products & Chemicals | 30 | 10 & 12 | Plaquemine, La. | Convent, La. | | Planned | Ford, Bacon & Davis, engineering |
| Algonquin Gas Transmission | 21.1 | 30 | Lambertville, N.J. area | | | Planned | for storage |
| ANR Storage Co. | 15.9 | 36 | Kalkasta Co., Mich. | Grand Traverse Co. Mich. | | | |
| Colorado Interstate Gas Co. | 300 | 20, 26, 30 | Wyo., Colo., Kan., Okla. | | 145 | Planned | Completion 83-84 |
| | 181.7 | 12, 16, 30 | Cheyenne compressor station | Latigo Junction, Colo. | 85.7 | Planned | |
| Columbia Gas Transmission Co. | 28.2 | 8 | Boone, Logan & Wyoming Co., W.V. | | | Planned | |
| | 25 | various | Ohio, Pa., W.V. | | | Planned | |
| | 26 | 8 | Clay, Owsley, Lee & Estill Cos., Ky. | | | Planned | |
| | 347 | 2 to 26 | Ohio, N.Y., Pa., Md., Ky. | | | Planned | |
| | 111 | 16 & 24 | Pa., Orange Co., N.Y. | | 72 | Planned | |
| | 21 | 20 | Monroe Ca., WV | | | Planned | |
| | 22 | 12 | Lawrence Co., PA | | | Planned | |
| | 33 | 6 & 12 | Crawford & Mercer Cos., PA | | | | |
| Columbia Gulf Transmission Co. | 12.9 | 10 to 16 | Ship Shoal area, offshore La. | | | Planned | |
| | 21 | 6 to 10 | Offshore La. | | 9 | Planned | |
| | 11 | 6 | Eugene Island area, offshore la. | | | Planned | |
| | 5 | 12 & 16 | Offshore La. | | 9.9 | Planned | |
| | 127.7 | 10, 12, 30 | Eugene Island, West Cameron areas, | offshore La | | Planned | |
| | 9.71 | 10 | Vermillion area, offshore La. | | 4.3 | Planned | |
| | 10.1 | 22 | Uinta Co., Utah | | 5 | Planned | |
| | 3.8 | 20 | South Pass area, offshore La. | | 4.8 | Planned | |
| | 18.4 | 20 | Garden Banks block 236 | West Cameron B-624 | | Planned | Completion late 1983 |
| Consolidated Gas Supply Corp. | 7.5 | 20 | High Island area, offshore Tex. | | 8.1 | Planned | |
| | 63 | 30 | Canton, Ohio | Ohio River | | Planned | |
| Continental Divide Pipeline Co. | 162 | 30 | Ignacio, Colo. | New Mexico | 124 | Planned | |
| Corpus Christi Oil & Gas (Tarpon Offshore Pipeline System) | 250 | 24 | North Padre Island | Sabine Pass | | Planned | |
| Faustina Pipeline | 100 | 36 | Erath, La. | plants near Baton Rouge | | Planned | |
| Florida Gas Transmission Co. | 19 | 12 | Putnam Co., Fla. | | 6.6 | Planned | |
| | 361 | 30 | Loops on system in La., Miss., Fla. | | | Planned | |
| Galaxie Energies | 22 | 10 | Lamar & Fayette cos., Ala. | | | Planned | |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| Owner | Miles | Size (In.) | To | From | Cost $MM | Status | Contractors or Engineers; Remarks |
|---|---|---|---|---|---|---|---|
| Great Lakes Transmission Co. | 365 | 20 | Mercer Co., N.D. | Thief River Falls, Minn. | | Planned | |
| | 125 | 36 | Minn., Mich., Wisc. | | | Planned | |
| | 42.3 | 36 | Kalkaska, Missaukee & Clare cos., Mich. | | | Planned | Completion 1983 |
| | 20.6 | 36 | Michigan | | 17.54 | Planned | Transport gas for Transco |
| High Island Offshore System | 66 | 36 | Offshore Tex. | | 101 | Planned | |
| Houston Pipe Line Co. | 40 | 12 | Webb Co., Tex. | | | Planned | |
| Kansas-Nebraska Natural Gas Co. | 26.4 | 16 & 20 | Sand Draw, Wyo. | | | Planned | Completion 1983 |
| | 10 | 16 | Freemont Co., Wyo. | | | Planned | Bids Out |
| Lone Star Producing Co. | 27.5 | 6 & 8 | Offshore Jefferson Co., Tx | Offshore Galveston, Tx. | | Planned | |
| Louisiana Resources Corp. | 14.1 | 30 | Vermillion Parish, La. | | | Planned | |
| | 21.3 | 24 | Cameron Parish, La. | | | Planned | |
| Memphis Gas, Light, & Water | 26 | 6-22 | Memphis, Tenn. | | | Planned | From coal gasification plant |
| MIGC Inc. | 35 | 10 | Recluse, Wyo. | Gillette, Wyo. | | Planned | Comp. late 1983 |
| MGTC | 53 | 6 | Moorecroft, Wyo. | Newcastle, Wyo. | | Planned | Comp. 1983 |
| Michigan Wisconsin Pipe Line Co. | 66 | 36 | Offshore Tex. | | 101 | Planned | |
| | 33 | 20 | Offshore La. | Cameron Parish, La. | 60.4 | Planned | |
| | 634 | 24 | Fremont Co., Wyo. | Greenburg, Kan. | 231 | Planned | (Pathfinder Pipeline) |
| National Fuel Gas Supply Corp. | 25 | 6-20 | NY & Pa. | | | Planned | |
| Natural Gas Pipeline of America | 120 | 4-10 | Yuma, Sedgewick & Phillips ctys., Colo. | | | Planned | Gathering lines |
| | 92 | 4, 5, 10, 12 | Garden, Deuel, Cheyenne & Morrill Cos., Neb. | | | Planned | |
| | 38 | 26 & 30 | Tex., Beckham Co., Okla. | | | Planned | Hutchinson & Gray ctys. |
| | 22.8 | 6, 10 & 14 | W. La., East Tx. | | 13.6 | Planned | |
| New England States Pipe Line | 350 | 36 | New Brunswick-Maine Border | Burrillville, RI | 560 | Planned | Deferred |
| Northern Natural Gas Co. | 69 | 4-8 | Minnesota, Nebraska | | | Planned | |
| | 120 | 4 to 12 | Iowa, Nebraska, Minnesota | | | Planned | |
| | 27 | 12 | Sprayberry field Texas | | 4.5 | Planned | 1984 completion |
| Northwest Alaska Pipeline Co. | 745 | 48 | Prudhoe Bay | Alaska-Yukon border | 10.6 | Planned | Delayed till 1984-87 |
| Northwest Pipeline Corp. | 175 | 4-12 | Moxa Arch area, SW Wyo. | | | Planned | Gathering lines |
| | 80 | 6 & 12 | Lincoln, Unita & Sweetwater ctys., Colo. | | | Planned | |
| | 243 | 30, 36 | Rangely, Colo. | Ignacio, Colo. | 210 | Planned | |
| | 43 | 22 | Oregon & Idaho | | | Planned | Loops |
| | 40 | 30 | Colorado | | | Planned | |
| | 75 | 4, 6 & 8 | Wyo., Colo., N.M. | | | Planned | |
| Pacific Gas & Electric | 112 | 34 | Little Cojo, Calif. | Gosford, Calif. | | Planned | Deferred |
| Pacific Gas Transmission Co. | 432 | 42 | Idaho, Wash., Ore. | | 301 | Planned | Looping ANGTS Western Leg—1989 |
| Palo Duro Pipeline Co. | 240 | 24 | Texas Panhandle | Sweetwater, Tex. | 96 | Planned | |
| Panhandle Eastern Pipeline cos. | 92 | 4, 6, 8 & 12 | Weld & Adams ctys., Colo. | | 37.4 | Planned | |
| | 37 | 4, 6, 8, 10 | Woods & Woodward ctys., Okla. | | | Planned | |
| | 32 | 8 & 10 | Major Co., Okla. | | | Planned | |
| Quivira Gas Co. | 25 | 18 | Eugene Island Offshore, La. | St. Mary's Parish, La. | | Planned | |
| | 24 | 12 | Eugene Island Offshore La. | | | Planned | |
| Rocky Mountain Pipeline Co. | 583 | 36 | Sage, Wyo. | Needles, Calif. | 515 | Planned | |
| Seagull Pipeline Co. | 258 | 12 & 24 | North of Brownsville | Galveston Co. | | Planned | |
| Southern California LNG Terminal | 63 | 32 | | Ventura Co., Calif. | | Planned | Deferred |
| Southern Natural Gas Co. | 40 | 18 | Offshore La. | | 9.6 | Planned | |
| Southern States Pipeline Co. | 32 | 12 | Norco, La. | Sorrento, La. | | Planned | |
| Southwest Gas Corp. | 20 | 16 | Mohave Co., Nev. | Arizona | | Planned | Connect W/EPNG Line |
| Tennessee Gas Pipeline | 253 | 10, 12, 30, 42 | NY, MA, NJ, CT, NH, PA, VA | | 373 | Planned | (Boundary Gas Project) |

LAY BARGE EQUIPMENT: CRC

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✓ ENDO CONVEYORS
✓ LINE-UP STATIONS
✓ JOINT COATING SYSTEMS
✓ SUPPORT ROLLERS
✓ AUTOMATIC WELDING SYSTEMS
✓ DOUBLE JOINTING SYSTEMS
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Crutcher Resources Corporation
CRC PIPELINE EQUIPMENT
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ELIZABETH, NEW JERSEY
TULSA, OKLAHOMA
SLOUGH, BERKSHIRE ENGLAND
EDMONTON, ALBERTA, CANADA
HOEVELAKEN, HOLLAND

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Circle 118 on Reader Service Card

| Owner | Miles | Size (In.) | From | To | Cost $MM | Status | Contractors or Engineers; Remarks |
|---|---|---|---|---|---|---|---|
| Texas Eastern Corp. | 29.5 | 30 & 36 | Delmont, Pa. | Bechtelsville, NJ | 39.1 | Planned | |
| | 97 | 30 | Perulak, Pa. | Lambertville, NJ | | Planned | Leidy Loops |
| | 1 | 36 | Perulak, Pa. | | | | |
| | 185 | 30 & 36 | High Island Offshore | E. Cameron area on/offshore La. | 240 | Postponed | (W/Tennessee Gas Pipeline) |
| Texas Gas Transmission Corp. | 12.51 | 20 | Eunice Compressor Sta. | | 12.706 | Planned | |
| | 4.92 | 12 | Roanoke System | Lakeside Mallard Bay | | Planned | |
| | 9.93 | 10 | Vermillion Parish | Lakeside Mallard Bay | | Planned | |
| Trans-Anadarko Pipeline System | 635 | 36 | Moore Co., Tex. | W. Monroe, La. | 700 | Planned | 1st phase – approved; 468 miles |
| Transcontinental Gas Pipe Line Corp. | 158 | 42 | Niagara Falls | Wharton-Leidy storage area, Pa. | 402.3 | Planned | (Niagara Pipeline) |
| | 28.5 | 12, 16, 20 | Brazos & Galveston areas, offshore Tex. | | 29.5 | Planned | W/Tennessee Gas Pipeline |
| | 3.3 | 16 | Ship Shoal 238B offshore La. | UMTV block 232 | | Planned | Comp. 3/83 |
| | 17.4 | 42 | MP 542.06 | Atchafalaya River, St. Landry Parish, La. | | Planned | Comp. 3/83 Loops |
| | 14.2 | 10 | Raccouri Island field, La. | | | Planned | Comp. 3/83 |
| | 30.6 | 24 | McMullen Lateral, Tex. | | | Planned | Comp. 3/83 Loops |
| | 23 | 42 | SW La. Lateral | Station 45 Calcasieu & Beauregard Parishes, La. | | Planned | Comp. 3/83 |
| | 6 | 42 | Station 45 | MP 473.98 Beauregard Parish, La. | | Planned | Comp. 3/83 |
| | 23 | 36 | Markham, Tex. | Intercoastal Canal Matagorda Co., Tex. | | Planned | Comp. 9/83 |
| | 9.8 | 8 & 12 | Brazos Block A-23 offshore Tex. | Brazos block A-19C | | Planned | Comp. 9/83 |
| | 2.8 | 24 | Brazos block A-19C offshore Tex. | Brazos block A-20 | | Planned | Comp. 9/83 |
| | 1.1 | 10 | Brazos A-20 | A-19C | | Planned | Comp. 9/83 |
| | 1.8 | 12 | High Island A-567 | UMTV block A-552 | | Planned | Comp. 9/83 |
| | 10 | 20 | High Island A-568 | UMTV block A-552 | | Planned | Comp. 9/83 |
| | 12 | 16 | Brazos A-132 | UMTV A-76 | | Planned | Comp. 10/83 |
| | 32 | 3 | Texas Coast | Brazos block 538 | | Planned | Comp. 10/83 |
| | 23 | 36 | Markham, Wharton & Matagorda Cos., Tex. | | | Planned | Central Texas Loops |
| | 1 | 12 | Galveston 392A offshore Tex. | UMTV block 392 | | Planned | Completion 11/83 |
| | 230 | 10-42 | Pa. & NJ | | | Planned | Loops on Leidy System |
| Transwestern Pipeline Co. | 35.7 | 20 | Chaves County, NM | De Baca County, NM | 23.6 | Planned | |
| | 80 | 20 & 12 | Hemphill County, Tex. | Roger Mills County, Okla. | 38.1 | Planned | |
| Valero Transmission Co. | 60 | 36 | Ft. Worth area | | | Planned | |
| Western LNG Terminal | 286 | 42 & 48 | Pt. Conception, Calif. | Los Angeles, Calif. | | Planned | Deferred |
| Western Gas Interstate Co. | 55 | 12 | SE New Mex. | Pyote, Tex. | 5.8 | Planned | |

## U.S. — Crude Oil Pipelines

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Continental Pipeline | 12 | 18 | Milne Point, Alaska | Kuparuk pipeline | | Planned | Comp. 1984 |
| Exxon Pipeline | 14.3 | 12 | Offshore Louisiana | | | Planned | |
| Four Corners Pipeline Co. | 300 | 16 to 20 | California | | | Planned | Bechtel (E) |
| Frontier Pipeline | 290 | 16 | Overthrust Belt NE Utah-SW Wyo. | Casper, Wyo. | 100 | Planned | |
| Koch Oil Co. | 15 | N.A. | North Dakota | | | Planned | |
| Northern Tier Pipeline | 798 | 42 | Port Ange[illegible] Wash. | Harlowton, Mont. | 1600 | Planned | Butler (E) and Williams Bros. (E). |
| | 693 | 40 | Harlowto[illegible]nt. | Clearbrook, Minn. | | | |
| Northville Industries | 174 | 30 | Texas C[illegible] | Houston, Freeport, Nederland, Tex. | | Planned | |
| Oil Shale Corp. | N.A. | N.A. | Wynnewood, Okla. | Duncan, Okla. | 12.6 | Planned | |
| Pacific Texas Pipeline Co. | 1026 | 42 | Long Beach, Calif. | Midland, Texas | 1400 | Planned | |
| Provident Energy Corp. | 204 | 16 | Kingman, Ariz. | Mobile, Ariz. | | Planned | Brown & Root (E) |
| Union Oil Co. of California | 18 | 10 | East Breaks 160 | High Island 536 offshore Tex. | | Planned | |
| United Brine Pipeline Corp. | 61 | 4 | Ingleside, Tex. | Victoria, Tex. | | Planned | |

## U.S. — Product Pipelines

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Alaska Interstate, Dow Chemical, Shell Chemical | 800 | 16-20 | Prudhoe Bay | Anchorage or Valdez | 1200 | Planned | |
| Celanese Chemical | 21 | 18 | Texas | | | Planned | Comp. 1985 |
| Continental Pipeline Co. | 88 | 6 | Sheridan, Wyo. | Gillette, Wyo. | | Planned | |
| Enterprise Pipeline | 23 | 8 | Napoleonville | Geismer, La. | | Planned | dual 8-in. LPG lines |
| | 145 | 8 | Sorrento, La. | Petal, Miss. | | Planned | Const. mid-83 LPG |
| Doyon Ltd. | 398 | 16 & 20 | Delta Junction, Alaska | Glenallen & Nikishka, Alaska | | Planned | LNG/Crude |
| Koch Oil Co. | 30 | 6 | Kingfisher, Okla | El Reno, Okla. | | Planned | LPG |
| MAPCO Inc. | 41 | 3 | Texas | | | Planned | LPG |
| Phillips Petroleum | 820 | 10 | Williston, ND | Conway, Kan. | | Planned | Tentative, no construction until 1984 w/MAPCO & HTI |
| Quivira Gas Co. | 25 | 6 | Eugene Island offshore La. | St. Mary's Parish | | Planned | Condensate |
| Seagull Products Co. | 280 | 6 & 8 | Upper Texas Gulf Coast Sour Lake & Port Arthur | Mt. Belvieu & Baytown | | Planned | Operational mid-1983 |
| Texas Eastman | 53 | 6 | Longview, Tx. | Shreveport, La. | | Planned | Conversion from gas |
| Transgulf Pipeline | 160 | undet. | La. & Fla. | | | Planned | Laterals off existing 24-in. to Terminals |
| | 12 | 4 & 26 | Fla. | | | Planned | Loops |

## U.S. — Carbon Dioxide Pipelines

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Amoco Production Co. | 300 | 24 | Bravo Dome area | Permian Basin fields, Tx. & NM | | Planned | |
| | 700 | | Permian Basin fields | | | Planned | $CO_2$ distribution laterals |
| Columbia Gas Transmission | 80 | undet. | Indian Creek field, WV | | | | Methane/$CO_2$ |
| Mobil Pipeline | 225 | 24 | New Mexico | West Texas | | Planned | |
| Pennzoil Production Co. | 42 | 8 | Rankin, Madison, Yazoo counties, Miss. | | | Planned | |
| Rocky Mountain $CO_2$ | 550 | | Western Wyoming | East Wyoming-Mont. & W. North Dakota | | Planned | |
| Shell Oil Co. | 85 | 20 | Rankin County, Miss. | Lincoln Co., Miss. | | Planned | |
| | 161 | 16, 20 | Lincoln County, Miss. | Weeks Island, La. | | Planned | |
| Shell Pipe Line Co. (Cortez Pipe Line) | 503 | 30 | Cortez, Colo. | Seminole, Tex. (Wasson Field) | 520 | U/C | Comp. mid-83; Willbros. Energy Services |

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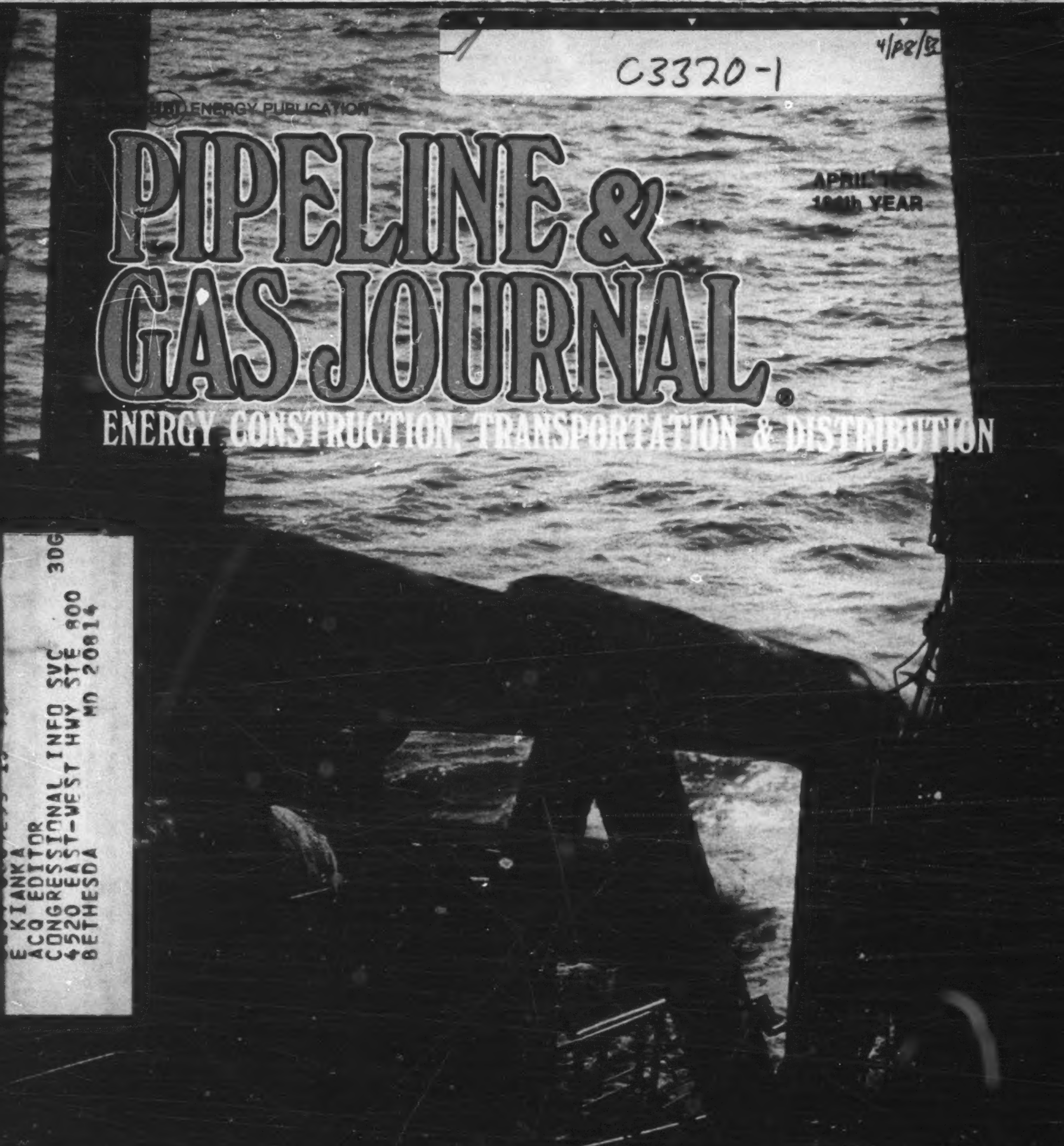

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**Offshore Pipelining Report**

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Founded in 1908, the Southern Gas Association has become the largest regional gas association in the U.S. For 75 years the SGA and the Southern gas industry have grown together. That growth is chronicled in a year-by-year historical review.

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The 8.3-mile, 12-in. gas pipeline from Exxon's Hondo platform in 850 ft of water in the Santa Barbara Channel to a gas treatment facility near Los Flores Canyon was completed in March. The project director on the job takes a look at the installation of the line.

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What's New In Valves And Valve Actuators .................... 61

**COVER**

Down the ramp into the North Sea offshore Denmark goes 30-in. gas line for Dansk Olie & Naturgas A/S, Denmark's state-owned gas company; line was installed by Saipem from the semisubmersible *Castoro Sei*.

*– staff photo by A. Dean Hale*

# Industry-wide slump keeps profits down

Petroleum industry profits continued to be adversely affected by poor economic conditions worldwide. The 65 oil companies responding to our survey report a 19.9% drop in earnings for the fourth quarter and a 19.8% decrease for the year. Profit margin for the group fell from 5.1% to 4.4%.

Mobil Corp.'s earnings dropped 52% in the fourth quarter, from $587 million to $282 million. U.S. oil earnings fell due to higher exploration expenses, low crude prices, and reduced demand for natural gas. Foreign oil earnings plunged 44% because of reduced liftings in the Middle East, higher exploration expenses, higher tax provisions in Norway, and lower crude prices.

Throughout 1982, petroleum supply exceeded demand, causing downward pressure on petroleum prices. As a result, Texaco reported a 39.6% decline in earnings for the quarter and a 44.5% drop for the year. The company also blamed OPEC for failing to recognize the realities of the marketplace, regarding both demand and the impact of spot market activity.

Gulf Oil's fourth quarter earnings dropped 24.5%, from $301 million to $226 million. Earnings for the year fell 26.9%. Gulf's chairman, James E. Lee, is not surprised that demand for the company's products fell for the third year in a row, "with much of industrial America flat on its back and the economies of Canada and Western Europe in a recession." The most seriously affected areas of Gulf's business was refining, marketing, and chemicals. Lower interest income, coupled with higher interest expense, also reduced net income.

Increased crude oil production, higher natural gas prices, and lower exploration expense and dry hole costs, generally offset the negative impact of lower crude prices, lower natural gas production, and higher writeoffs at Shell Oil. Net income for the quarter fell from $458 million to $438 million, a 4.4% decline. Earnings for the year were down 5.6%.

Sun Co. reported a 66.3% drop in earnings for the fourth quarter and a 50.1% decline for the year. Profit from U.S. exploration and production fell to $145 million from $165 million and after-tax costs of $22 million due to trimming of its workforce contributed to the decline.

Higher exploration expenses and increased interest costs combined to cause a 2.9% drop in net income for the quarter and a 3.5% decrease for the year at Standard Oil (Ohio).

Atlantic Richfield's earnings for the year increased slightly to $1.676 billion from $1.671 billion in 1981. Increased production of crude oil from the North Slope of Alaska, higher prices for natural gas, and improved earnings from refining and marketing were the principle reasons for the increase. Net income for the quarter fell 7.6%.

Smaller losses for overseas downstream operations and higher Canadian petroleum earnings were behind Standard Oil (Indiana)'s 8.1% fourth quarter gain in net income. Earnings for the year were down 5%, benefiting from a significant recovery in U.S. refining, marketing, and transportation activities.

Exxon reported earnings in the fourth quarter of $1.48 billion compared to $1.38 billion in the same period of 1981, an increase of 6.9%. For the year, net income dropped 13.3%, from 4.18 billion in 1982 to $4.82 billion in 1981.

Higher charges attributable to their expanded exploration program, reduced American Petrofina's net income in the fourth quarter to $14.8 million, a 12.7% decline from 1981's $16.9 million. Earnings for the year dropped 26.6%.

Belco Petroleum reported a 5.3% increase in net income for the quarter and a 5.8% rise for the year, due primarily to higher natural gas production and prices in the U.S., higher oil and gas production in Peru, and higher oil and gas production coupled with significantly

OIL COMPANIES' FOURTH QUARTER FINANCIAL REPORTS

| Company | Three months ending December 31** | | | | | | Twelve months ending December 31** | | | | | | Profit Margin | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Revenues ($000) | | | Earnings* ($000) | | | Revenues ($000) | | | Earnings* ($000) | | | | |
| | 1982 | 1981 | % Chg. | 1982 | 1981 | % Chg. | 1982 | 1981 | % Chg. | 1982 | 1981 | % Chg. | 1982 | 1981 |
| Amerada Hess | 2,116,414 | 2,339,424 | - 9.5 | 43,613 | 48,248 | - 9.6 | 8,394,085 | 9,443,630 | - 11.1 | 168,662 | 212,591 | - 20.7 | 2.0 | 2.3 |
| American Petrofina | 530,350 | 531,209 | - 0.2 | 14,835 | 16,989 | - 12.7 | 2,253,678 | 2,522,154 | - 10.6 | 54,401 | 74,140 | - 26.6 | 2.4 | 2.9 |
| Argonaut Energy | 623 | 2,366 | - 73.7 | (677) | 164 | | 2,221 | 5,870 | - 62.2 | 2,606 | (151) | | 17.3 | |
| Ashland Oil | 2,079,812 | 2,409,350 | - 13.7 | 23,722 | 42,020 | - 43.5 | 8,780,340 | 9,885,230 | - 11.2 | 124,586 | 94,592 | + 31.7 | 1.4 | 1.0 |
| Asamera | | | | | | | 449,241 | 470,593 | - 4.5 | 3,597 | 9,693 | - 62.9 | 0.8 | 2.1 |
| Atlantic Richfield | 7,095,135 | 7,140,262 | - 0.6 | 434,007 | 469,818 | - 7.6 | 26,990,557 | 28,208,255 | - 4.3 | 1,676,078 | 1,671,290 | + 0.3 | 6.2 | 5.9 |
| Belco Petroleum | 98,330 | 82,333 | + 19.4 | 27,769 | 26,366 | + 5.3 | 344,367 | 317,098 | + 8.6 | 104,034 | 98,350 | + 5.8 | 30.2 | 31.0 |
| Brock Exploration[1] | 2,280 | 2,808 | - 18.8 | 215 | 558 | - 61.5 | 5,370[2] | 6,267[2] | - 14.3 | (350)[2] | 581[2] | | | 9.3 |
| Callon Petroleum[3] | 6,193 | 3,627 | + 71.0 | 75 | 327 | - 77.1 | 21,510 | 11,432 | - 88.2 | 1,446 | 1,689 | - 14.4 | 7.0 | 15.0 |
| Commonwealth Oil Refin. | 19,800 | 203,500 | - 90.3 | 23,800 | 175,700 | - 86.4 | 307,800 | 1,012,900 | - 69.6 | 45,900 | 258,700 | - 82.3 | 14.9 | 25.5 |
| Crown Central | 497,202 | 422,061 | + 17.8 | 4,598 | 14,865 | - 69.1 | 1,782,000 | 1,502,000 | + 18.6 | 7,016 | 3,362 | +108.7 | 0.4 | 0.2 |
| Damson Oil[4] | 71,803 | 49,766 | + 44.3 | 6,134 | 5,096 | + 20.4 | | | | | | | 8.5 | 10.2 |
| Diamond Shamrock | 755,339 | 872,548 | - 13.4 | 46,196 | 59,733 | - 22.7 | 3,177,379 | 3,376,215 | - 5.9 | 149,543 | 230,156 | - 35.0 | 4.7 | 6.8 |
| Dorchester Gas[3] | 409,516 | 228,299 | + 79.4 | 5,614 | 5,450 | + 3.0 | 1,159,101[6] | 712,033[6] | + 62.8 | 17,812[6] | 31,287[6] | - 43.1 | 1.5 | 4.4 |
| Dyco Petroleum | 12,810 | 13,759 | - 6.9 | 3,597 | 4,624 | - 22.2 | 56,509 | 49,182 | + 14.9 | 15,532 | 14,992 | + 3.6 | 27.5 | 30.5 |
| Engle Exploration[1] | 1,080 | 153 | +605.9 | (650) | (114) | | 2,524[2] | 569[2] | +343.6 | (1,411)[2] | (234)[2] | | | |
| Enstar Corp. | 80,479 | 100,589 | - 20.0 | 11,125 | 8,812 | + 26.3 | 342,796 | 360,842 | - 5.0 | 42,103 | 41,567 | + 1.3 | 12.3 | 11.5 |
| Equity Oil | 6,334 | 6,192 | + 2.3 | 1,364 | 1,292 | + 5.6 | 23,674 | 24,951 | - 5.1 | 3,268 | 5,572 | - 41.3 | 13.8 | 22.3 |
| Exxon | 26,393,545 | 29,756,561 | - 11.3 | 1,480,932 | 1,385,215 | + 6.9 | 103,558,545 | 114,922,561 | - 9.9 | 4,185,932 | 4,826,215 | - 13.3 | 4.0 | 4.2 |
| Felmont | 19,450 | 22,820 | - 14.8 | 3,005 | 4,353 | - 31.0 | 77,472 | 79,091 | - 2.0 | 14,037 | 16,749 | - 16.2 | 18.1 | 21.2 |
| Forest Oil Corp. | 36,410 | 38,523 | - 5.5 | 2,109 | 1,507 | + 40.0 | 152,465 | 142,335 | + 7.1 | 12,009 | 5,104 | +135.3 | 7.9 | 3.6 |
| Freeport McMoRan | 191,831 | 199,754 | - 4.0 | (17,447) | 26,059 | | 747,888 | 835,404 | - 10.5 | 65,946 | 159,366 | - 58.6 | 8.8 | 19.1 |
| General American | 88,907 | 85,645 | + 3.8 | 12,985 | 18,557 | - 30.0 | 347,883 | 354,016 | - 1.7 | 59,009 | 59,680 | - 1.1 | 17.0 | 16.9 |
| Getty Oil | 3,000,878 | 3,472,840 | - 13.6 | 172,445 | 216,266 | - 20.3 | 12,311,612 | 13,251,560 | - 7.1 | 690,712 | 855,902 | - 19.3 | 5.6 | 6.5 |
| Gulf Energy & Develop. | 27,718 | 17,652 | + 57.0 | 1,308 | 2,981 | - 56.1 | 91,110 | 60,132 | + 51.5 | 5,102 | 8,047 | - 36.6 | 5.6 | 13.4 |
| Gulf Oil Corp. | 8,160,000 | 7,935,000 | + 2.8 | 226,000 | 301,000 | - 24.9 | 30,658,000 | 30,461,000 | + 0.7 | 900,000 | 1,231,000 | - 26.9 | 2.9 | 4.0 |
| Holly Corp.[7] | 104,255 | 129,794 | - 19.7 | 5,445 | 5,398 | + 0.9 | 539,628 | 412,438 | + 28.7 | 10,516 | 5,672 | + 85.4 | 1.9 | 1.4 |
| Inexco Oil | 47,478 | 62,621 | - 24.2 | 4,070 | 9,596 | - 57.6 | 217,539 | 238,738 | - 8.9 | 18,865 | 31,921 | - 40.9 | 8.7 | 13.4 |
| Louisiana L&E | 331,302 | 342,791 | - 3.3 | 23,173 | 18,533 | + 25.0 | 1,205,175 | 1,277,539 | - 5.7 | 76,252 | 145,229 | - 47.5 | 6.3 | 11.4 |
| Mapco Inc. | 540,701 | 581,242 | - 7.0 | 19,695 | 31,114 | - 36.7 | 1,992,947 | 2,179,034 | - 8.5 | 73,822 | 96,890 | - 23.8 | 3.7 | 4.4 |
| Maynard Oil | | | | | | | 33,307 | 43,799 | - 23.9 | (3,399) | 4,520 | | | 10.3 |
| Mesa Petroleum | 103,295 | 99,399 | + 3.9 | 27,712 | 28,120 | - 12.1 | 406,963 | 407,744 | - 0.2 | 115,945 | 106,379 | + 9.0 | 28.5 | 26.1 |
| Mitchell Energy[8] | 255,785 | 285,666 | - 10.5 | 22,446 | 35,280 | - 36.4 | 961,713 | 1,064,844 | - 9.7 | 80,303 | 115,217 | - 30.3 | 8.4 | 10.8 |
| Mobil Corp. | 16,184,000 | 18,095,000 | - 10.6 | 282,000 | 587,000 | - 52.0 | 63,828,000 | 68,587,000 | - 6.9 | 1,380,000 | 2,433,000 | - 43.3 | 2.2 | 3.6 |
| Murphy Oil | 714,914 | 684,686 | + 4.4 | 40,141 | 38,458 | + 4.4 | 2,698,840 | 2,543,380 | + 6.1 | 159,093 | 163,006 | - 2.4 | 5.9 | 6.4 |
| Natomas | 441,322 | 441,359 | | (8,367) | 48,807 | | 1,655,786 | 1,582,396 | + 4.6 | 44,000 | 232,527 | - 81.1 | 2.7 | 14.7 |
| Noble Affiliates | 91,526 | 106,166 | - 13.8 | 9,858 | 21,972 | - 55.1 | 408,787 | 394,606 | + 3.6 | 70,261 | 80,281 | - 12.5 | 17.2 | 20.6 |
| Oxoco | 12,402 | 12,723 | - 2.5 | 2,139 | 2,768 | - 22.7 | 39,226 | 28,340 | + 38.4 | 7,392 | 5,563 | + 32.9 | 18.8 | 19.6 |
| Pacific Resources | 395,270 | 314,559 | + 25.7 | 6,873 | 9,608 | - 28.5 | 1,237,219 | 1,081,477 | + 14.4 | 9,798 | 17,106 | - 42.7 | 0.8 | 1.6 |
| Pennzoil Co. | 529,144 | 652,982 | - 19.0 | 50,486 | 54,778 | - 7.8 | 2,268,511 | 2,681,751 | - 15.4 | 188,713 | 221,642 | - 14.9 | 8.3 | 8.3 |
| Petro-Lewis | 92,546 | 53,829 | + 72.1 | 7,931 | 4,312 | + 84.0 | 240,700[9] | 180,000[9] | + 33.7 | 17,200[9] | 30,400[9] | - 43.4 | 7.1 | 7.9 |
| Prairie Producing Co. | 5,539 | 7,425 | - 25.4 | 1,857 | 730 | +154.4 | 25,570 | 30,061 | - 14.9 | 5,259 | 6,758 | - 22.2 | 20.6 | 22.5 |
| Phillips Petroleum | 4,062,727 | 4,091,181 | - 0.7 | 154,593 | 186,526 | - 17.1 | 15,891,612 | 16,287,753 | - 2.4 | 645,856 | 879,364 | - 26.6 | 4.1 | 5.4 |
| Premier Resources[4] | 2,963 | 3,518 | - 15.8 | (2,319) | (1,326) | | 13,185 | 12,061 | + 9.3 | (1,691) | (345) | | | |
| Presidio Oil | 3,486[9] | 3,918[9] | - 10.9 | 255[9] | 498[9] | - 48.8 | 1,727 | 1,924 | - 10.2 | 105 | 183 | - 42.6 | 6.1 | 9.5 |
| Quaker State | 210,144 | 229,177 | - 8.3 | 7,216 | 6,747 | - 7.0 | 928,933 | 918,913 | + 1.1 | 38,568 | 27,367 | + 41.0 | 4.2 | 3.0 |
| Sabine Corp. | 49,706 | 46,749 | + 6.3 | 3,017 | 5,628 | - 46.3 | 197,422 | 172,670 | + 14.3 | 24,450 | 28,342 | - 13.7 | 12.4 | 16.4 |
| Shell Oil | 5,176,000 | 5,193,000 | - 0.3 | 438,000 | 458,000 | - 4.4 | 20,214,000 | 21,739,000 | - 7.0 | 1,605,000 | 1,701,000 | - 5.6 | 7.9 | 7.8 |
| Southland Royalty | 83,374 | 99,054 | - 15.8 | 4,884 | 8,895 | - 45.1 | 357,925 | 400,139 | - 10.5 | 28,659 | 36,216 | - 20.9 | 8.0 | 9.1 |
| Southwestern Energy | 16,660 | 13,315 | + 25.1 | 4,675 | 2,991 | + 56.3 | 62,712 | 54,756 | + 14.5 | 13,020 | 12,533 | + 3.9 | 20.8 | 22.9 |
| Standard Indiana | 7,500,000 | 7,800,000 | - 3.8 | 415,000 | 384,000 | + 8.1 | 29,900,000 | 31,700,000 | - 5.7 | 1,826,000 | 1,922,000 | - 5.0 | 6.1 | 6.1 |
| Standard Ohio | 3,216,700 | 3,773,300 | - 14.7 | 463,900 | 477,800 | - 2.9 | 13,529,200 | 14,140,200 | - 4.3 | 1,879,100 | 1,946,900 | - 3.5 | 13.9 | 13.8 |
| Statex Petroleum[8] | 3,003 | 3,368 | - 10.8 | (72) | 581 | | | | | | | | | 17.3 |
| Sun Co. | 4,100,000 | 4,500,000 | - 8.9 | 151,000 | 448,000 | - 66.3 | 16,300,000 | 16,400,000 | - 0.6 | 537,000 | 1,076,000 | - 50.1 | 3.3 | 6.6 |
| Superior Oil | 504,100 | 560,500 | - 10.1 | 24,000 | 73,200 | - 67.2 | 2,040,500 | 2,057,400 | - 0.8 | 223,400 | 361,300 | - 38.2 | 10.9 | 17.6 |
| Tenneco | 3,978,100 | 4,312,200 | - 7.8 | 288,000 | 260,000 | + 10.8 | 15,396,300 | 15,383,100 | + 0.1 | 819,000 | 813,000 | + 0.7 | 4.9 | 4.9 |
| Tesoro[4] | 604,368 | 652,750 | - 7.4 | 9,627 | 19,376 | - 50.3 | 2,439,853 | 3,034,768 | - 19.6 | 42,518 | 73,583 | - 42.2 | 1.7 | 2.4 |
| Texaco Inc. | 11,700,000 | 14,600,000 | - 19.9 | 306,000 | 507,000 | - 39.6 | 48,000,000 | 59,300,000 | - 19.1 | 1,281,000 | 2,310,000 | - 44.5 | 2.7 | 3.9 |
| Tomlinson Oil[3] | 24,447 | 27,100 | - 9.8 | (216) | (865) | | | | | | | | | |
| Tosco Corp. | 913,745 | 901,492 | + 1.4 | 3,054 | 30,095 | - 90.0 | 3,465,964 | 3,431,491 | + 1.0 | 132,312 | 22,579 | +486.4 | 3.8 | 0.7 |
| Total Petroleum N.A. | 583,772 | 654,938 | - 10.9 | 5,248 | (14,667) | | 2,233,056 | 2,380,538 | - 6.2 | 12,752 | (63,608) | | 0.6 | |
| Union Oil of California | 2,736,100 | 2,911,400 | - 6.0 | 225,100 | 236,000 | - 4.6 | 10,899,100 | 11,296,200 | - 3.5 | 804,000 | 791,400 | + 1.6 | 7.4 | 7.0 |
| Universal Resources | 12,599 | 17,282 | - 27.0 | (115) | 3,679 | | 58,117 | 63,707 | - 8.8 | 6,609 | 13,601 | - 51.4 | 11.4 | 21.4 |
| Woods Petroleum | 22,088 | 22,900 | - 3.5 | 6,483 | 8,632 | - 24.9 | 83,048 | 71,969 | + 15.4 | 23,018 | 21,897 | + 5.1 | 27.7 | 30.4 |
| Worldwide Energy | 17,367 | 16,338 | + 6.0 | 1,262 | 568 | +122.2 | 58,777 | 54,474 | + 7.9 | 857 | (574) | | 1.5 | |
| TOTAL | 117,073,267 | 128,231,763 | - 8.7 | 5,486,525 | 6,846,218 | - 19.9 | 461,869,469 | 499,649,530 | - 7.6 | 20,474,523 | 25,522,789 | - 19.8 | 4.4 | 5.1 |

**Excluding non-recurring items. *Earnings available to common stock. ( ) Loss. [1] Ends March 31. [2] Nine months. [3] Ends Nov. 30. [4] Ends Sept. 30. [6] Ends Aug. 31. [7] Ends July 31. [8] Ends Jan. 31. [9] Six months.

higher oil prices and tax credits in Canada.

Callon Petroleum's fourth quarter earnings fell 77.1%, from $327,000 to $75,000. Net income for 1982 dropped to $1.4 million from $1.6 million in 1981, a 14.4% decline.

While gas processing, refining and marketing-terminalling operations improved, contract drilling and industrial equipment sales posted substantial losses at Dorchester Gas, resulting in a 43.1% drop in earnings for 1982. Net income for the quarter however, increased 3%.

Enstar's 1982 net income increased slightly to $42.1 million, compared with 1981 earnings of $41.6 million due to decreased interest expense and a lower after-tax charge for the redemption fund of the Virginia International Company Special Stock. Fourth quarter earnings increased 26.3%.

Lower level of dry hole expense improved fourth quarter results considerably at Equity Oil where net income increased 5.6%. For the year, however, earnings dropped 41.3%, from $5.57 million in 1981 to $3.26 million in 1982.

Felmont Oil reported earnings of $3 million for the fourth quarter 1982 compared to $4.35 million in 1981, a 31% drop-off. Net income for the year fell 16.2%, from $16.7 million to $14 million.

Hampered by customer gas curtailment, soft liquid prices, and higher feedstock costs, Gulf Energy & Development's earnings dropped 56.1% for the quarter and 36.6% for the year.

The worldwide slowdown in economic activity adversely affected Louisiana Land and Exploration's earnings for 1982 which dropped 47.5%. Lower oil, copper, and refined product prices as well as decreased demand for copper and natural gas contributed significantly to the decline. Net income for the quarter increased 25% due to a lower effective tax rate, improved real estate sales, and a reduction in overhead and petro-

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GAS COMPANIES' FOURTH QUARTER FINANCIAL REPORTS

| | Three months ending December 31** | | | | | | Twelve months ending December 31** | | | | | | Profit Margin | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Revenues ($000) | | | Earnings* ($000) | | | Revenues ($000) | | | Earnings* ($000) | | | | |
| Company | 1982 | 1981 | % Chg. | 1982 | 1981 | % Chg. | 1982 | 1981 | % Chg. | 1982 | 1981 | % Chg. | 1982 | 1981 |
| Alabama Tennessee N.G. | 36,277 | 30,263 | + 20.0 | 1,542 | 1,651 | - 6.6 | 132,872 | 116,805 | + 13.8 | 5,858 | 5,786 | + 1.2 | 4.4 | 5.0 |
| ARKLA | 316,247 | 282,333 | + 12.0 | 10,166 | 8,386 | + 21.2 | 1,296,584 | 1,179,139 | + 1.0 | 95,380 | 87,560 | + 8.9 | 7.4 | 7.4 |
| Coastal Corp. | 1,582,419 | 1,314,797 | + 20.4 | 22,582 | 1,929 | +1070.7 | 5,818,797 | 5,925,476 | - 1.8 | 65,630 | (20,399) | | 1.1 | |
| Columbia Gas | 1,407,690 | 1,351,070 | + 4.2 | 64,357 | 74,357 | - 13.0 | 5,070,591 | 4,426,243 | + 14.6 | 180,063 | 194,085 | - 7.2 | 3.6 | 4.4 |
| Consolidated N.G. | 883,670 | 810,597 | + 9.0 | 37,312 | 37,942 | - 1.7 | 3,210,985 | 2,738,164 | + 17.3 | 155,420 | 131,656 | + 18.1 | 4.8 | 4.8 |
| El Paso Companies | 1,188,990 | 1,127,620 | + 5.4 | (12,926) | 39,409 | | 4,364,042 | 3,909,023 | + 11.6 | 53,236 | 147,257 | - 63.8 | 1.2 | 3.8 |
| ENSERCH Corp. | 913,433 | 852,953 | + 7.1 | 25,747 | 46,140 | - 44.2 | 3,787,675 | 3,362,474 | + 12.6 | 157,353 | 196,959 | - 20.1 | 4.2 | 5.8 |
| InterNorth | 1,188,406 | 1,029,312 | + 15.4 | 30,799 | 60,937 | - 49.5 | 4,158,986 | 3,641,567 | + 14.2 | 181,275 | 253,512 | - 28.5 | 4.4 | 7.0 |
| Kansas-Nebraska N.G. | 135,086 | 133,311 | + 1.3 | 8,516 | 6,911 | + 23.2 | 488,319 | 451,037 | + 8.3 | 26,452 | 25,574 | + 3.4 | 5.4 | 5.7 |
| National Fuel Gas | 276,932 | 267,766 | + 3.4 | 6,777 | 12,308 | - 44.9 | 1,006,714 | 912,438 | + 10.3 | 27,048 | 27,846 | - 2.9 | 2.7 | 3.1 |
| Northwest Energy | 599,514 | 452,847 | + 32.4 | 29,130 | 18,008 | + 61.8 | 1,601,832 | 1,377,259 | + 16.3 | 60,238 | 68,107 | - 11.6 | 3.8 | 4.9 |
| NOVA, An Alberta Corp. | 1,054,973 | 798,675 | + 32.1 | 32,473 | 20,378 | + 59.4 | 3,501,798 | 2,669,551 | + 31.2 | 91,181 | 97,028 | - 6.0 | 2.6 | 3.6 |
| ONEOK Inc. | 255,422 | 274,518 | - 7.0 | 8,113 | 12,317 | - 34.1 | 1,088,620 | 1,109,843 | - 1.9 | 49,988 | 59,078 | - 15.4 | 4.6 | 5.3 |
| Pacific Lighting | 1,196,123 | 1,006,128 | + 18.9 | 39,208 | 18,897 | +107.5 | 4,404,395 | 3,401,489 | + 29.5 | 122,946 | 117,225 | + 4.9 | 2.8 | 3.4 |
| Panhandle Eastern | 880,075 | 803,229 | + 9.6 | 35,368 | 48,664 | - 27.3 | 3,391,465 | 3,266,253 | + 3.8 | 219,876 | 216,604 | - 16.0 | 6.5 | 8.0 |
| Peoples Energy | 335,971 | 367,077 | + 8.7 | 4,548 | 11,119 | - 59.0 | 1,511,384 | 1,395,243 | + 8.3 | 39,381 | 50,228 | - 21.6 | 2.6 | 3.6 |
| Pioneer Corp. | 252,579 | 317,516 | - 20.5 | 18,688 | 25,206 | - 25.9 | 1,118,736 | 1,224,645 | - 8.6 | 91,244 | 110,204 | - 17.2 | 8.2 | 9.0 |
| Sonat Inc. | 747,598 | 728,047 | + 2.7 | 43,999 | 44,643 | - 1.4 | 2,737,696 | 2,629,003 | + 4.1 | 204,639 | 173,672 | + 17.8 | 7.5 | 6.6 |
| Texas Eastern Corp. | 1,502,728 | 1,242,618 | + 20.9 | 13,382 | 60,124 | - 77.7 | 5,654,353 | 4,526,114 | + 24.9 | 161,334 | 220,634 | - 26.9 | 2.9 | 4.9 |
| Texas Gas Transmission | 770,205 | 764,851 | + 0.7 | 27,399 | 25,981 | + 5.5 | 2,877,590 | 2,649,265 | + 8.6 | 111,268 | 128,684 | - 13.5 | 3.9 | 4.9 |
| TransCanada PipeLines | 899,727 | 925,455 | - 2.8 | 50,905 | 42,592 | + 19.5 | 3,466,915 | 3,404,897 | + 1.8 | 161,128 | 125,573 | + 28.3 | 4.6 | 3.7 |
| Transco Energy Co. | 1,060,900 | 897,201 | + 18.2 | 20,899 | 41,286 | - 49.4 | 3,869,329 | 3,475,667 | + 11.3 | 129,202 | 132,343 | - 2.4 | 3.3 | 3.8 |
| Union Gas Ltd. | 301,586 | 280,686 | + 7.4 | 9,536 | 10,208 | - 6.6 | 705,525[1] | 621,537[1] | + 13.5 | 13,669[1] | 12,116[1] | + 12.8 | 1.9 | 1.9 |
| United Energy Res. | 1,316,100 | 1,505,300 | - 12.6 | 33,300 | 56,800 | - 41.4 | 5,561,800 | 5,431,000 | + 2.4 | 192,400 | 215,700 | - 10.8 | 3.5 | 4.0 |
| Westcoast Transmission | 362,114 | 363,904 | - 0.5 | 14,998 | 19,065 | - 21.3 | 1,153,440 | 1,270,330 | - 9.2 | 70,047 | 65,426 | + 7.1 | 6.1 | 5.2 |
| TOTAL | 19,464,765 | 17,928,574 | + 8.6 | 576,818 | 734,651 | - 21.5 | 71,980,443 | 65,114,462 | + 10.5 | 2,666,226 | 2,887,458 | - 7.7 | 3.7 | 4.4 |

** Excluding non-recurring items. *Earnings available to common stock. [1] Nine months. ( ) Loss.

leum operating costs.

Natomas posted an 81.1% drop in net income for 1982. Higher interest expenses and declines from Natomas' international and domestic petroleum operations are blamed. For the quarter, the company reported an $8.4 million loss.

The depressed contract drilling market as well as a decline in oil and gas operating income caused by foreign exchange losses, high dry hole expenses, and weak natural gas demand resulted in a 55.1% decline in fourth quarter earnings for Noble Affiliates. Net income for 1982 fell 12.5%.

Oxoco's 1982 earnings increased 32.9% due primarily to higher profitability on oil and gas activities. For the quarter, net income fell 22.7%.

Sharply reduced natural gas sales, losses in the metals division, and a decrease in sulphur sales combined in 1982 for a 14.9% drop in earnings at Pennzoil for the year and a 7.8% decrease for the quarter.

Superior Oil reported a 67.2% decrease in net income in the fourth quarter and a 38.2% drop in 1982. In addition to the impact of the recession on oil and gas prices, the company experienced larger lease impairments, higher exploration and dry hole costs, and absorbed substantial losses of its mining affiliates.

In spite of a harsh recessionary economy, Tenneco posted record net income for both the year and the fourth quarter. In 1982, earnings increased from $813 million to $819 million. For the quarter, net income increased 11.8%.

Continuing depressed domestic drilling activity, reduced production levels of foreign crude oil and natural gas, and reduced domestic crude oil prices are blamed for Tesoro Petroleum's 50.3% decline in fourth quarter earnings and a 42.2% drop-off for the year.

Fourth quarter earnings at Tosco Corp. were down 90%, while net income for the year increased 486%. Even though the year was highly profitable, toward the end of 1982 a costly and destructive war to increase market position by the majors reduced gasoline prices, sometimes below the cost of crude oil, the company noted.

Lower demand for natural gas and related services contributed to a 21.5% decline in fourth quarter earnings for the 25 gas companies in our survey group. Profit margin fell from 4.4% to 3.7%.

The El Paso Company's gain in earnings from exploration and production activities, sales of natural gas liquids, and the sale of an interest in certain insurance assets was more than offset by the adverse effect of a reduction in gas market demand, reduced revenues and volumes on the sales of chemical products and higher interest expense. The company reported a loss for the quarter and a 63.8% decline in earnings for the year.

Peoples Energy's fourth quarter earnings dropped 59% due to reduced gas sales resulting from the sluggish economy, substantially warmer weather, and the loss of large-volume commercial and industrial sales to low-sulphur No. 6 oil, along with higher operating costs. For the year, net incomes declined 21.6%.

The downturn in the petroleum industry is blamed for ONEOK's 34.1% drop-off in earnings for the quarter and 15.4% decline for the year.

A decline in earnings from Pacific Lighting's utility sector was made up by a substantial increase in earnings from their federally regulated gas pipeline operations, and oil and gas exploration and production activities. Fourth quarter earnings were up 107%, while net income for the year increased 4.9%.

TransCanada PipeLines' earnings increased from $42.5 million in the previous quarter to $50.9 million in the fourth quarter. For 1982, net income was up 28.3%.

United Energy Resources' 1982 operations were adversely affected by the recession in the energy sector, resulting in a 41.4% decline in fourth quarter earnings and a 10.8% drop-off for the year. ■

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AN HBJ ENERGY PUBLICATION

# PIPELINE & GAS JOURNAL®

ENERGY CONSTRUCTION, TRANSPORTATION & DISTRIBUTION

JUNE 1983
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Liquids Pipe[illegible]

Slurry Pipeline [illegible]

VisiCalc For Pi[illegible]ine En[illegible]ering

# PIPELINE & GAS JOURNAL

*International Pipeline & Gas Utility Design, Construction & Operation*

*Published Continuously Since 1859*

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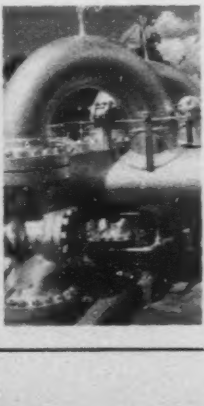
**COVER**



Liquids pipelines transport nearly one-half of the more than 15 million barrels of petroleum products used daily in the U.S., carrying them through more than 280,000 miles of trunk pipelines and gathering lines. This month's cover, staff photo by editor Dean Hale, of piping at a Texas Eastern Products Pipeline Co. station manifold at Lick Creek, Ill.

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Natural gas liquids flow some 1900 miles from the lush countryside of Northern Alberta through the U.S. via Minnesota, Iowa, Illinois, and Michigan to Sarnia, Ontario, operating safely thanks to a highly sophisticated gas detection system installed at every station.

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P&GJ's 17th annual E/C/S Directory lists highly specialized engineering-construction-service firms worldwide with the expertise needed to solve difficult engineering and construction problems for pipelines, utilities.

## U.S. & Canadian Coal Slurry Pipelines

| Company | Miles | Sizes (In.) | From | To | Estimated Cost ($Millions) | Status | Contractor or Engineering Co. | Annual Tonnage (Millions) |
|---|---|---|---|---|---|---|---|---|
| Alberta Economic Development, Energy & Natural Resources Ministries | 500 | Unk. | Hinton, Alberta | West Coast Port | – | Planned | Fluor (E) | N.A. |
| Allen-Warner Valley Energy Systems (Nevada Power Co.) | 183 | 20, 22 | Alton, Utah | Allen Station | $270 | Deferred | Engineering Management, Inc. (E) | 9.1 |
| | 73 | 9, 12 | Alton, Utah | Warner Valley, Utah | – | Deferred | | 2.5 |
| Coalstream Pipeline Co. (Continental Resources Inc.) | 1500 | 24-48 | Kentucky | Florida | $3000 | Deferred | Fluor (E) | 55 |
| Energy Transportation Systems Inc. | 1387 | 40 | Wyoming | Baton Rouge, La. | $2000 | Planned | Bechtel (E) | 37 |
| | 500 | N.A. | Oklahoma | Houston | N.A. | Planned | Bechtel | N.A. |
| Pacific Bulk Transportation Systems (Boeing Engineering & Construction Co.) | 650 | | Emory, Carbon counties, Utah | Oxnard, Calif. | $500 | Planned | Boeing (E) | 10 |
| Powder River Pipeline Inc. | 1923 | 42 | S.E. Montana | Great Lakes areas, other terminals | $2500 | Deferred | – | 36 |
| San Marco Pipeline Co. (Houston Natural Gas, Rio Grande Industries) | 900 | 20, 24 | S.E. Colorado | Texas Gulf Coast | $800 | Deferred | – | 15 |
| Snake River System (N.W. Energy, Gulf Interstate) | 1100 | 20, 24 | N.E. Wyoming | Idaho, Oregon | $500 | Deferred | – | 10 |
| Tesoro Petroleum Corp. | 1000 | 30 | Kentucky | Southeastern U.S. | $1000 | Deferred | – | N.A. |
| Virginia Electric Power Co. | 420 | 12-36 | Proud, W.V. | Portsmouth, Va. | $250 | Deferred | – | 10 |

# Will 1983 Be Slurry's Big Year?

by Dean Hale, *Editor*

Will any new coal slurry pipelines be built in the United States in the next decade – or ever? The coal slurry pipeline projects that have been announced appear to have ample justification: electric utilities plan to utilize more coal in the future for power generation boiler fuel, and pipeline transportation unquestionably will be more economical than rail transportation.

Coal slurry pipelines in the past seven years have found an adversary that has proven very tough to battle – the U.S. Congress. Coal slurry pipelines, to succeed, need the right of *eminent domain* to successfully acquire needed rights-of-way. Railroad lobbyists have successfully fought the granting of this right to the coal slurry pipelines. Railroad lobbyists are among the strongest in Washington.

Ironically, the same railroads that are fighting the pipelines over *eminent domain* and are blocking pipeline passage over their rail lines were granted – by Congress – the same land privileges of *eminent domain* in the 1880s and used it to build their extensive systems.

Fortunately, in the 98th Congress currently in session, two major bills concerned with coal slurry pipelines and their right of *eminent domain* have been proceeding in an orderly fashion. In the U.S. Senate, S.267, Coal Distribution and Utilization Act of 1983, introduced Jan. 27, 1983, received a favorable vote of 13-7 and is expected to reach the Senate floor in mid-June. The Senate Committee on Energy and Natural Resources approved the bill after okaying amendments that would make the pipelines and their electric utility customers equally liable for any pollution damage and requiring that the pipelines be buried wherever possible, with disturbed surface areas revegetated. Amendments that "expressly delegate to the states" power to regulate pipeline activities involving water were also approved.

In the House of Representatives, H.R. 1010, the Coal Pipeline Act of 1983, also introduced Jan. 27, was approved by the Committee on Interior and Insular Affairs, 27-13. The bill is being considered by the Committee on Public Works and Transportation, and if approved by mid-June, will then be sent to the House Rules Committee. The bill could be on the House floor for a vote by mid-July.

Once the Senate and House approve the respective bills, the legislation moves to a conference committee for the "ironing out" of differences. The final bill would then require approval by Senate and House before being sent to the White House for signing.

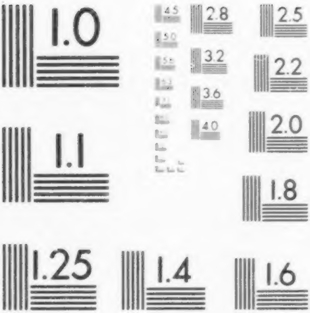
Both bills have received favorable consideration in both houses, particularly because of the protective amendments on state water rights. Industry observers say they have "good feelings" on this year's legislation and expect it to pass despite hard lobbying.

### Progress on Projects

Of the 9 major coal slurry pipeline projects in the U.S. and one in Canada, totalling some 10,136 miles (detailed in the accompanying table), only the **Energy Transportation Systems, Inc.** (ETSI) project is approaching fruition. All others have been deferred for one reason or another – but are still being actively considered.

ETSI plans a 1387-mile, 40-in. $3.8 billion from Wyoming to Oklahoma, Arkansas, and Louisiana. A 500-mile "branch" to the Houston, Texas area, extending from Oklahoma, is also being considered, but not as part of the main project.

ETSI also plans a 267-mile pipeline in South Dakota to delivery water to the coal slurry preparation plant near Gillette, Wyo. ETSI has acquired 90% of the right-of-way on the slurry line route and 70% of the ROW for the water line. ETSI has a final environmental impact study. Six additional permits covering water discharge and air quality standards have been received in Oklahoma and Arkansas. Basic engineering is complete. Contracts for engineering and construction management have been awarded to Bechtel Petroleum Inc. Construction is expected to begin in 1984, with completion estimated in 1986. **P&GJ**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JULY 1983

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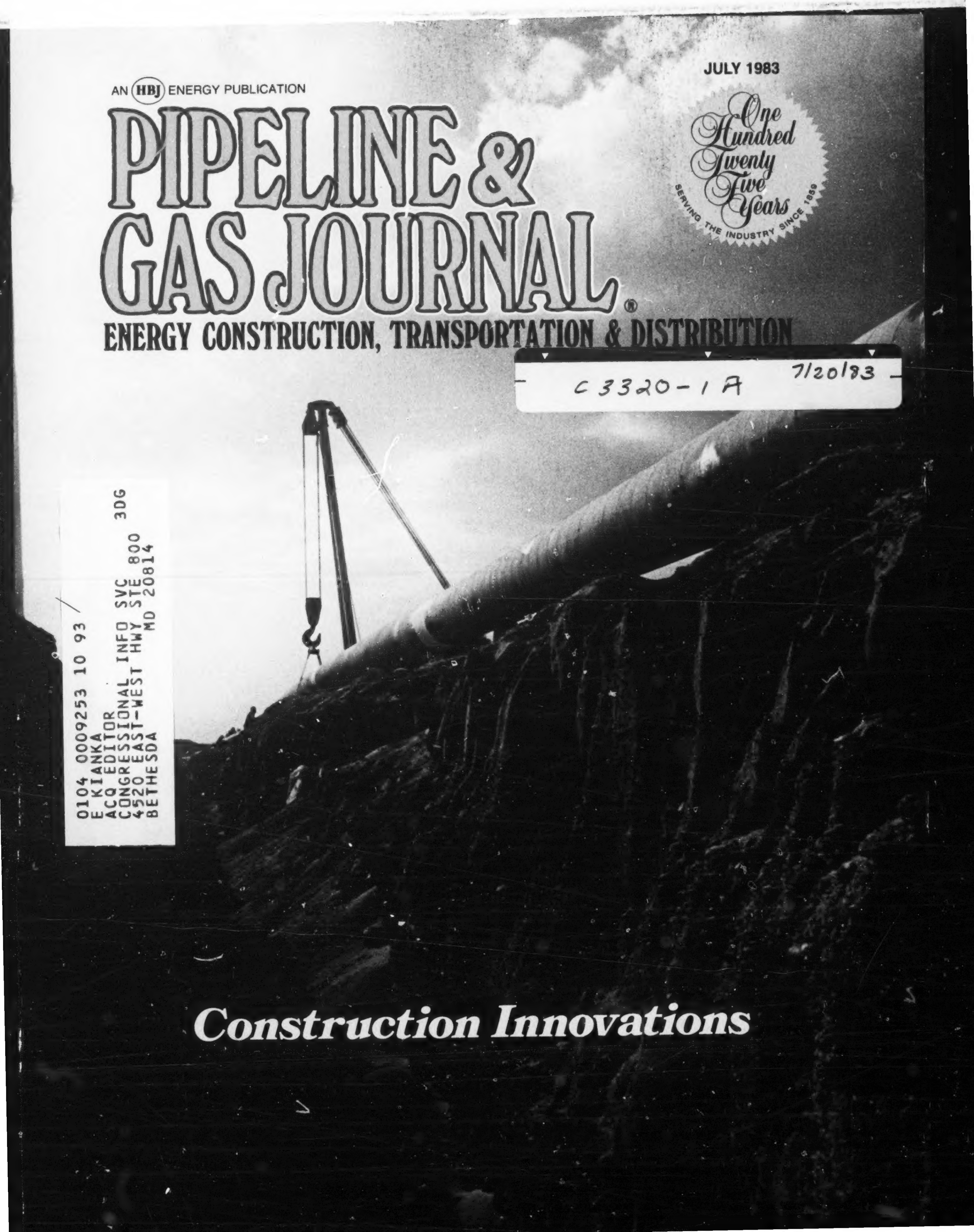

## Construction Innovations

# PIPELINE & GAS JOURNAL

*International Pipeline & Gas Utility Design, Construction & Operation*

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What may be the calculated optimum design for a pipeline system one year under one set of economic conditions may change significantly in another year, given a new set of circumstances. Engineers must design pipelines to provide the highest return on the investment, and the lowest cost of service for an expected economic life of a planned facility.

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Construction equipment is becoming smaller, larger, more versatile, and more specialized. These are the latest machines that can handle the most demanding job in any environment.

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Underground pipelines are particularly susceptible to damage from an earthquake. Any interruption to these vital "lifelines" poses a direct threat to human life and life support systems.

Southern Louisiana Swamp Job
Tests Contractor's Adaptability.............38

Job recently completed by R. B. Potashnick Co. for Transcontinental Gas Pipeline in Louisiana encountered deep mud and heavy rains, testing contractor and equipment. Both came through with reputations enhanced.

**COVER** . Pipelining isn't all hustle and bustle; there are moments of brief pause to reflect on new ideas, new horizons. Backdrop for this month's cover is a gas line installation in Egypt near Cairo's suburbs, just prior to lowering-in.

*– photo courtesy William Press Company*

# Oversupplies dampen profit picture

An oversupply of crude oil and of refined products was primarily responsible for the drop in earnings in the oil industry during the first quarter of 1983.

While the refining and marketing sectors of most companies lost money, the profit picture was also dampened by unusually warm weather and the recession, reducing demand and lowering prices.

The 99 companies responding to our survey report net income of $4.2 billion, a 16.6% drop from the previous year. Profit margin for the group fell from 3.9% to 3.6%.

Gains in crude oil, condensate, and natural gas production were more than offset by significantly reduced refining and marketing earnings and higher year-to losses in metals at Atlantic Richfield. Net income fell 14% during the first quarter.

Exxon posted a 26% increase in income for the quarter, earning $839 million in 1982 and $1.06 billion in 1983.

Disappointing results in refining, marketing, and chemicals operations due to an intensely competitive market are blamed for Gulf Oil's 37% decline in net earnings. The company faults companies with large quantities of low-cost Alaskan oil for forcing down gasoline prices in the U.S.

Mobil Corp. reported a 32% drop in earnings for the first quarter, falling from $369 million in 1982 to $250 million in 1983.

Increased interest charges resulting from the Cities Service acquisition adversely affected Occidental Petroleum's earnings picture. Net income in the first quarter 1982 was $61.1 million compared to $25.9 million this year.

A $38.6 million settlement from FERC more than offset the effect of sharply curtailed natural gas sales at Pennzoil. Earnings increased from $38.9 million in 1982 to $40.3 million in 1983.

Standard Oil of California's 35% earnings increase resulted mainly from the lower cost of crude oil,

GAS COMPANIES' FIRST QUARTER FINANCIAL REPORTS

| | Three months ending March 31** | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Revenues ($000) | | | Earnings* ($000) | | | Profit Margin‡ | |
| Company | 1983 | 1982 | % Chg. | 1983 | 1982 | % Chg. | 1983 | 1982 |
| Alabama Tennessee N.G. | 43,240 | 37,273 | + 16.0 | 1,643 | 1,671 | - 1.7 | 3.8 | 4.5 |
| American Nat. Resources | 982,500 | 1,063,300 | - 7.6 | 60,900 | 79,900 | - 23.8 | 6.2 | 7.5 |
| ARKLA | 410,450 | 398,729 | + 2.9 | 32,741 | 45,781 | - 28.5 | 8.0 | 11.5 |
| Coastal Corp. | 1,562,136 | 1,565,505 | - 0.2 | 14,063 | 6,002 | +134.3 | 0.9 | 0.4 |
| Columbia Gas | 1,756,506 | 1,875,546 | - 6.3 | 67,677 | 93,455 | - 27.6 | 3.[illegible] | 5.0 |
| Consolidated Nat. Gas | 1,217,102 | 1,200,451 | + 1.4 | 70,179 | 87,695 | - 20.0 | 5.8 | 7.3 |
| El Paso Companies | 1,222,838 | 1,055,581 | + 15.9 | 14,290 | 21,192 | - 32.6 | 1.2 | 2.0 |
| ENSERCH Corp. | 991,561 | 1,004,460 | - 1.3 | 43,516 | 59,495 | - 26.9 | 4.4 | 5.9 |
| Houston N.G.[1] | 696,727 | 785,162 | - 11.3 | 47,697 | 63,511 | - 24.9 | 6.8 | 8.1 |
| InterNorth | 1,359,742 | 1,449,253 | - 6.2 | 101,513 | 106,144 | - 4.4 | 7.5 | 7.3 |
| Mountain Fuel Supply | 203,708 | 182,042 | + 11.9 | 26,457 | 22,479 | + 17.7 | 13.0 | 12.4 |
| National Fuel Gas | 402,991 | 398,741 | + 1.1 | 18,282 | 25,027 | - 27.0 | 4.5 | 6.3 |
| Northwest Energy | 803,542 | 486,945 | + 65.0 | 32,577 | 32,564 | | 4.1 | 6.7 |
| NOVA, An Alberta Corp. | 1,067,000 | 730,000 | + 46.2 | 32,500 | 27,400 | + 18.6 | 3.1 | 3.8 |
| ONEOK Inc.[2] | 349,072 | 378,689 | - 7.8 | 22,184 | 30,539 | - 27.4 | 6.4 | 8.1 |
| Pacific Lighting | 1,267,059 | 1,174,430 | + 7.9 | 32,507 | 28,757 | + 13.0 | 2.6 | 2.4 |
| Panhandle Eastern | 1,034,329 | 956,671 | + 8.1 | 61,568 | 73,361 | - 16.1 | 6.0 | 7.7 |
| Peoples Energy | 593,963 | 702,009 | - 15.3 | 34,013 | 40,536 | - 16.0 | 5.7 | 5.7 |
| Pioneer Corp. | 288,665 | 302,413 | - 4.5 | 21,517 | 29,843 | - 27.9 | 7.5 | 9.9 |
| Sonat Inc. | 846,192 | 815,673 | + 3.7 | 65,605 | 63,199 | + 3.8 | 7.8 | 7.7 |
| Southern Union Co. | 345,810 | 344,494 | + 0.4 | 13,879 | 13,040 | + 6.4 | 4.0 | 3.8 |
| Texas Eastern Corp. | 1,459,441 | 1,424,588 | + 2.4 | 37,650 | 61,925 | - 39.2 | 2.6 | 4.3 |
| Texas Gas Transmission | 791,556 | 783,264 | + 1.1 | 24,766 | 29,791 | - 16.9 | 3.1 | 3.8 |
| TransCanda PipeLines | 923,493 | 1,020,555 | - 9.5 | 46,423 | 38,724 | + 19.9 | 5.0 | 3.8 |
| Transco Energy Co. | 1,166,626 | 916,659 | + 27.3 | 36,785 | 36,062 | + 2.0 | 3.2 | 3.9 |
| United Energy Resources | 1,259,819 | 1,574,863 | - 20.0 | 39,659 | 64,197 | - 38.2 | 3.1 | 4.1 |
| Westcoast Transmission | 331,930 | 424,274 | - 21.8 | 17,173 | 19,534 | 12.1 | 5.2 | 4.6 |
| TOTAL | 23,377,998 | 23,051,570 | + 1.4 | 1,017,764 | 1,201,824 | - 15.3 | 4.4 | 5.2 |

*Earnings available to common. **Excluding non-recurring items. ‡Earnings* divided by Revenues.

[1] Ends April 30. [2] Ends February 28.

BEST AVAILABLE COPY

OIL COMPANIES' FIRST QUARTER FINANCIAL REPORTS

| | Three months ending March 31** | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Revenues ($000) | | | Earnings* ($000) | | | Profit Margin‡ | |
| Company | 1983 | 1982 | % Chg. | 1983 | 1982 | % Chg. | 1983 | 1982 |
| Adobe Oil & Gas Corp. | 41,703 | 53,864 | - 22.6 | 5,671 | 5,901 | - 3.9 | 13.6 | 11.0 |
| Altex Oil | 892 | 1,671 | - 46.6 | (319) | (30) | | | |
| Amerada Hess | 1,844,206 | 2,373,216 | - 22.3 | 4,988 | (16,164) | | 0.3 | |
| American Pacific | 4,849 | 2,929 | + 65.6 | (361) | (777) | | | |
| American Petrofina | 425,339 | 575,214 | - 26.1 | 336 | 15,995 | - 97.9 | 0.1 | 2.8 |
| American Quasar | 11,552 | 14,815 | - 22.0 | (585) | 1,959 | | | 13.2 |
| Anglo Energy | 62,147 | 93,748 | - 33.7 | (12,055) | 2,109 | | | 2.3 |
| Arapaho Petroleum | 1,324 | 1,519 | - 12.8 | (264) | (222) | | | |
| Argo Petroleum | 5,226 | 5,692 | - 8.2 | (725) | (593) | | | |
| Ashland Oil | 1,814,065 | 2,213,666 | - 18.1 | (23,592) | (20,868) | | | |
| Asamera | 88,882 | 113,465 | - 21.7 | (5,653) | (690) | | | |
| Atlantic Richfield | 6,364,360 | 6,534,489 | - 2.6 | 330,379 | 385,409 | - 14.3 | 5.2 | 5.9 |
| Beard Oil | 8,354 | 9,109 | - 8.3 | (352) | 429 | | | 4.7 |
| Belco Petroleum | 76,145 | 81,630 | - 6.7 | 27,467 | 26,728 | + 2.8 | 36.1 | 32.7 |
| Buttes Gas & Oil | 32,244 | 54,125 | - 40.0 | 1,127 | 2,062 | - 45.0 | 3.5 | 3.8 |
| Callon Petroleum[1] | 6,163 | 4,804 | + 28.3 | 4 | 680 | - 99.4 | 0.1 | 14.2 |
| Commonwealth Oil Ref. | 10,900 | 164,200 | - 93.3 | (3,000) | (18,000) | | | |
| Consolidated O&G[1] | 9,510 | 11,535 | - 17.6 | (1,178) | (2,172) | | | |
| Crown Central | 347,433 | 413,604 | - 16.0 | (10,833) | (3,367) | | | |
| Crystal Oil | 49,032 | 61,027 | - 19.7 | (355) | (783) | | | |
| Damson Oil | 20,896 | 16,263 | + 28.5 | 2,255 | 1,491 | + 51.2 | 10.8 | 9.2 |
| Diamond Shamrock | 855,433 | 791,135 | + 8.1 | 4,634 | 29,149 | - 84.1 | 0.5 | 3.7 |
| Discovery Oil | 1,620 | 967 | + 67.5 | (484) | (235) | | | |
| Dorchester Gas[1] | 417,050 | 201,007 | +107.5 | 2,589 | 3,988 | - 35.1 | 0.6 | 1.9 |
| Dyco Petroleum | 12,740 | 14,287 | - 10.8 | 2,372 | 3,950 | - 39.9 | 18.6 | 27.7 |
| Energy Reserves Group | 38,421 | 42,247 | - 9.1 | 3,546 | 573 | +518.8 | 9.2 | 1.4 |
| Enstar Corp. | 93,815 | 95,074 | - 1.3 | 11,229 | 10,541 | + 6.5 | 12.0 | 11.1 |
| Equity Oil | 5,512 | 6,017 | - 8.4 | 1,142 | 1,238 | - 7.8 | 20.7 | 20.6 |
| Exeter Oil | 1,096 | 1,071 | + 2.3 | 105 | 156 | - 32.7 | 9.6 | 14.6 |
| Exxon | 23,705,000 | 26,841,000 | - 11.7 | 1,060,000 | 839,000 | + 26.3 | 4.5 | 3.1 |
| Felmont Oil Corp. | 21,454 | 18,028 | + 19.0 | 4,244 | 2,865 | + 48.1 | 19.8 | 15.9 |
| Forest Oil Corp. | 36,904 | 39,069 | - 5.5 | 4,028 | 3,425 | + 17.6 | 10.9 | 8.8 |
| Freeport McMoRan | 204,215 | 194,875 | + 4.8 | 21,114 | 26,536 | - 20.4 | 10.3 | 13.6 |
| Galaxy Oil | 3,243 | 3,340 | - 2.9 | (346) | (564) | | | |
| Getty Oil | 3,005,091 | 3,140,090 | - 4.3 | 157,844 | 179,740 | - 12.2 | 5.3 | 5.7 |
| Gulf Energy & Dev. | 30,014 | 15,374 | + 95.2 | 1,256 | 435 | +188.7 | 4.2 | 2.8 |
| Gulf Oil Corp. | 6,898,000 | 7,535,000 | - 8.5 | 182,000 | 288,000 | - 36.8 | 2.6 | 3.8 |
| Hadson Petroleum | 4,714 | 10,555 | - 55.3 | 1,034 | 5,180 | - 80.0 | 21.9 | 49.1 |
| Hamilton Bros. Petroleum | 45,564 | 54,155 | - 15.9 | 3,398 | 5,911 | - 42.5 | 7.5 | 10.9 |
| Helmerich & Payne | 61,872 | 94,762 | - 34.7 | 10,923 | 20,418 | - 46.5 | 17.7 | 21.5 |
| Hershey Oil | 1,781 | 1,786 | - 0.3 | 273 | 225 | + 21.3 | 15.3 | 12.6 |
| Howell Corp. | 40,590 | 66,838 | - 39.3 | 105 | 794 | - 86.8 | 0.3 | 1.2 |
| Howell Petroleum | 22,321 | 22,814 | - 2.2 | 2,494 | 2,042 | + 22.1 | 11.2 | 9.0 |
| Inexco Oil | 42,568 | 62,827 | - 32.2 | 2,693 | 7,607 | - 64.6 | 6.3 | 12.1 |
| KRM Petroleum | 1,095 | 1,370 | - 20.1 | 13 | 130 | - 90.0 | 1.2 | 9.5 |
| Lear Petroleum | 54,105 | 54,706 | - 1.1 | 4,607 | 1,765 | +161.0 | 8.5 | 3.2 |
| Louisiana L&E | 253,277 | 304,297 | - 16.8 | 26,630 | 13,452 | + 98.0 | 10.5 | 4.4 |
| Mapco Inc | 469,436 | 480,836 | - 2.4 | 13,370 | 16,013 | - 16.5 | 2.8 | 3.3 |
| May Petroleum | 8,709 | 7,519 | + 15.8 | (649) | 663 | | | 8.8 |
| Maynard Oil | 8,865 | 11,338 | - 21.8 | (261) | 1,015 | | | 9.0 |
| MCO Holdings Inc. | 39,937 | 43,731 | - 8.7 | 2,391 | 4,206 | - 43.1 | 6.0 | 9.6 |
| McFarland Energy | 3,774 | 3,759 | + 0.4 | 988 | 986 | + 0.2 | 26.2 | 26.2 |
| Mesa Petroleum | 106,715 | 104,139 | + 2.5 | 37,836 | 29,604 | + 27.8 | 35.5 | 28.4 |
| Mitchell Energy[2] | 240,462 | 231,137 | + 4.0 | 19,187 | 16,313 | + 17.6 | 8.0 | 7.1 |
| Mobil Corp. | 14,288,000 | 16,439,000 | - 13.1 | 250,000 | 369,000 | - 32.2 | 1.8 | 2.2 |
| Moran Energy | 23,379 | 29,059 | - 19.5 | 1,386 | 4,083 | - 66.0 | 5.9 | 14.1 |
| Murphy Oil | 711,009 | 744,356 | - 4.5 | 27,871 | 33,378 | - 16.5 | 3.9 | 4.5 |
| Natomas | 366,557 | 389,629 | - 5.9 | (6,551) | 49,854 | | | 12.8 |
| Noble Affiliates | 77,555 | 114,688 | - 32.4 | 7,083 | 22,438 | - 68.4 | 9.1 | 19.6 |
| Norris Oil | 716 | 675 | + 6.1 | 39 | 172 | - 77.3 | 5.4 | 25.5 |
| Nugget Oil Corp.[3] | 1,652 | 2,568 | - 32.2 | (280) | 258 | | | 10.0 |
| Occidental Petroleum | 4,890,000 | 4,211,700 | + 16.1 | 25,900 | 62,100 | - 58.3 | 0.5 | 1.5 |
| Oxoco | 11,675 | 7,501 | + 55.6 | 2,040 | 1,691 | + 20.6 | 17.5 | 22.5 |
| Pacific Resources | 269,513 | 284,042 | - 5.1 | (4,732) | (1,747) | | | |
| Pennzoil Co. | 559,816 | 587,176 | - 4.7 | 40,318 | 38,951 | + 3.5 | 7.2 | 6.6 |
| Petroleum Development | 5,327 | 2,228 | +139.1 | 308 | (336) | | 5.8 | |
| Petro-Lewis | 100,523 | 57,664 | + 74.3 | 9,950 | 1,883 | +428.4 | 9.9 | 3.3 |
| Prairie Producing Co. | 4,637 | 7,130 | - 35.0 | 590 | 1,416 | - 58.3 | 12.7 | 19.9 |
| Phillips Petroleum | 3,637,000 | 3,805,000 | - 4.4 | 129,000 | 192,000 | - 32.5 | 3.6 | 5.0 |
| Presidio Oil | 1,590 | 2,216 | - 28.2 | 83 | 286 | - 71.0 | 5.2 | 12.9 |
| Quaker State | 213,227 | 224,012 | - 4.8 | 6,157 | 5,824 | + 5.7 | 2.9 | 2.6 |
| Sabine Corp. | 32,574 | 47,880 | - 32.0 | 3,800 | 5,726 | - 32.2 | 11.9 | 12.0 |
| Seneca Oil | 5,120 | 5,512 | - 7.1 | (1,323) | (593) | | | |
| Shell Oil | 4,645,000 | 4,842,000 | - 4.1 | 246,000 | 345,000 | - 28.7 | 5.3 | 7.1 |
| Southland Royalty | 82,428 | 94,838 | - 13.0 | 8,741 | 8,596 | + 1.7 | 10.6 | 9.1 |
| Southwestern Energy | 26.177 | 21,011 | + 24.6 | 5,449 | 4,220 | + 29.1 | 20.8 | 20.1 |
| Standard California | 6,995,000 | 10,020,000 | - 30.2 | 310,000 | 230,000 | + 35.0 | 4.4 | 2.3 |
| Standard Indiana | 7,500,000 | 7,200,000 | + 4.2 | 399,000 | 470,000 | - 5.1 | 5.3 | 6.5 |
| Standard Ohio | 2,766,000 | 3,617,000 | - 23.5 | 277,000 | 455,000 | - 39.1 | 10.0 | 12.6 |
| Statex Petroleum[3] | 3,003 | 3,368 | - 10.8 | (72) | 581 | +113.7 | 2.4 | 17.2 |
| Sun Co. | 3,740,000 | 4,060,000 | - 7.9 | 90,000 | 124,000 | - 27.4 | 2.4 | 3.1 |
| Sundance Oil | 22,646 | 23,364 | - 3.1 | 2,078 | (2,810) | | 9.2 | |
| Superior Oil | 457,563 | 530,684 | - 13.8 | 23,698 | 83,378 | - 71.6 | 5.2 | 15.7 |
| Tenneco | 3,609,000 | 3,766,000 | - 4.2 | 111,000 | 128,943 | - 13.9 | 3.1 | 3.4 |
| Tesoro | 515,138 | 606,346 | - 15.0 | 4,134 | 3,765 | + 9.8 | 0.8 | 0.6 |
| Texaco Inc. | 10,148,000 | 12,986,000 | - 21.9 | 319,000 | 367,000 | - 13.1 | 3.1 | 2.8 |
| Texas American | 73,467 | 69,713 | + 5.4 | 2,582 | 2,002 | + 28.9 | 3.5 | 2.9 |
| Texas International | 34,976 | 44,777 | - 21.9 | 238 | 2,977 | - 92.0 | 0.7 | 6.7 |
| Tosco Corp. | 725,115 | 823,011 | - 11.9 | (46,603) | 510 | | | 0.1 |
| Total Petroleum N.A. | 501,164 | 544,387 | - 7.9 | (37,096) | 4,596 | | | 0.8 |
| Tribune Oil | 769 | 569 | + 35.2 | 314 | 182 | + 72.5 | 40.8 | 32.0 |
| Union California | 2,474,000 | 2,481,600 | - 0.3 | 128,300 | 168,500 | - 23.9 | 5.2 | 6.8 |
| Universal Resources | 12,578 | 17,086 | - 26.4 | (623) | 3,008 | | | 17.6 |
| Wainoco Oil | 12,910 | 13,598 | - 5.1 | 1,059 | (2,746) | | 8.2 | |
| Westcoast Petroleum | 14,018 | 11,420 | + 22.7 | 3,608 | 2,992 | + 20.6 | 25.7 | 26.2 |
| Wilshire Oil of Texas | 2,812 | 3,027 | - 7.1 | 747 | 279 | +167.7 | 26.6 | 9.2 |
| Wiser Oil | 14,990 | 14,750 | + 1.6 | 3,960 | 3,642 | + 8.7 | 26.4 | 24.7 |
| Woods Petroleum | 18,480 | 20,332 | - 9.1 | 4,710 | 5,767 | - 18.3 | 25.5 | 28.4 |
| Worldwide Energy | 17,619 | 14,145 | + 24.6 | 1,381 | (144) | | 7.8 | |
| TOTAL | 117,573,338 | 132,086,797 | - 11.0 | 4,243,504 | 5,089,840 | - 16.6 | 3.6 | 3.9 |

*Earnings available to common. **Excluding non-recurring items. ( ) Loss. ‡Earnings* divided by revenues. [1]Ends February 28. [2]Ends April 30. [3]Ends January 31.

reduced exploration expenses, and some firming of petroleum product prices toward the end of the quarter.

Standard Oil of Indiana's 5% earnings decline was largely attributable to poorer results for U.S. refining, marketing, and transportation operations, which suffered from severely depressed margins as a result of competitive gasoline market conditions.

Lower crude oil prices and sales volumes in petroleum exploration and production operations and lower margins in refining and marketing operations contributed to Standard Oil of Ohio's 39% drop in net income.

The combined effect of surplus supplies of crude oil, excess manufacturing capacity, and unneeded marine tonnage had a depressing impact on the gross operating margins for Texaco's manufacturing and marketing operations. Net income declined 13%.

American Petrofina's 98% drop in net earnings was primarily due to losses in the refining and marketing segment, where severe competition during the first two months of the quarter held prices below costs.

Anglo Energy posted a $12 million loss for the quarter due to reduced spending for exploration and production of oil and gas by major and independent oil companies in reaction in part to lower oil prices and gas oversupplies.

Ashland Oil also reported a net loss amounting to $14.5 million. The economic recession and petroleum market instability was blamed.

A net loss was reported by Beard Oil, totaling $352,000. Operating revenues were adversely affected by a decline in oil and gas sales due to lower oil prices and production and a decline in drilling and well servicing revenues.

Belco Petroleum posted a 3% increase in net income as a result of higher oil and gas production and prices in Canada and higher gas prices in the U.S.

Recent softness in oil and gas prices and the continued slowdown of industry-wide activities took its toll at Callon Petroleum. Earnings dropped 99%.

Despite increased revenues from expanded marketing activities, net income at Dorchester Gas decreased 35% due to lower gas takes resulting from the current oversupply of natural gas as well as continued weakness in coal markets and in contract drilling.

Improved results from gas transmission and distribution operations in Alaska and $4.1 million realized after taxes from the sale of a coal-producing property in Texas contributed to Enstar's 6.5% increase in earnings.

Gulf Energy & Development reported a 189% increase in net income due to increased gas throughput, increased natural gas liquid products sales, and higher natural gas liquid sales prices.

The 42.5% decline in earnings at Hamilton Brothers Petroleum was a result of decreased income from gas transportation systems, resulting from the current weak demand for natural gas.

Howell Corp. posted an 87% drop in earnings due to the continued weakness of conventional fuel products markets.

Louisiana Land & Exploration's net income increased 98% as a result of a decrease in dry holes and exploration charges and reduced overhead expenditures.

Losses sustained by onshore contract drilling operations were primarily responsible for the 66% drop in earnings at Moran Energy.

Natomas reported a $6.6 million loss for the first quarter due mainly to a loss by their transportation subsidiary, increased interest expense, and reduced prices for international petroleum production.

Superior Oil's 72% drop in earnings was due to lower world crude oil prices, unusually warm weather, and the recession's lingering impact on oil and gas demand.

Declines in exploration and production and refining and marketing resulted in a 14% drop in net income at Tenneco.

Texas International's net earnings dropped from $3 million in 1982 to $238,000 in the first quarter of 1983.

The 27 gas companies responding to our survey reported a 15% drop in net earnings in the first quarter. Profit margin fell from 5.2% to 4.4%.

The warm winter drove American Natural Resources' net income down 24% from the first quarter of 1982.

Coastal Corp. reported a 135% increase in earnings. Most of the improvement came from natural gas pipeline operations.

Consolidated Natural Gas Co. posted a 20% decline in net earnings due to the warmest weather in 30 years.

Successful oil and gas development drilling by Mountain Fuel subsidiaries contributed to the 18% increase in net income.

The main reasons for Pacific Lighting's 12% increase in earnings were better results of utility and energy-related operations.

Peoples Energy reported a 16% drop in net income due to increasing losses of large-volume commercial and industrial business to No. 6 oil, the low level of economic activity in the Chicago area, customer conservation, and unsatisfactory rate orders.

Lower prices and production volumes for North Sea oil, as well as combined effects of continued U.S. recession and mild winter weather resulted in a 39% drop in earnings at Texas Eastern.

United Energy Resources reported a drop of 38% in net earnings due to the economic recession, low alternate fuel prices, and the excess supply of natural gas. ■

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# FINANCIAL NOTEBOOK

**Capital appropriations** by the nation's 1,000 largest manufacturers remained virtually unchanged at $21 billion (seasonally adjusted) in the first quarter, according to The Conference Board.

The petroleum industry, whose appropriations are both volatile and large, increased its appropriations 17.3% during the quarter while other manufacturing industries recorded an 8% decline overall.

The Conference Board reports the current outlook is for capital appropriations to rise only 6% this year. Excluding petroleum, appropriations are expected to be up only 1%.

**Mergers/acquisitions.** Coquina Oil (Midland, Tex.), formerly a Fluor unit, was acquired by American National Petroleum (Houston, Tex.).

Meenan Oil agreed to sell the operating assets of its Blueray Systems unit to a Vari Corp. subsidiary.

Noarko Resources (Denver, Colo.) and Aztec Energy (Farmington, N. M.) agreed to merge.

Hamilton Brothers Petroleum agreed to sell its entire equity position in Gulf Energy & Development to The Penn Central Corp. for $22.3 million.

Canadian Occidental Petroleum will acquire Canada-Cities Service for $362.5 million (Canadian).

Terrapet Energy (Dallas, Tex.) withdrew from negotiations concerning the acquisition of Teton Energy (Denver, Colo.).

Diamond Shamrock plans to acquire up to 30.4 million common shares of Natomas Co. (San Francisco, Calif.). The company also intends to propose a merger of the two companies.

**Properties acquired.** United States Oil plans to purchase a block of Federal oil/gas leases covering about 54,500 acres in Montana.

Western Energy Development sold a 16.45% working interest in 11 producing wells and 507 surrounding acres in Runnels County, Tex. to Northstar Energy for $2.5 million.

**Money Markets.** Beard Oil plans to close on the sale of $10 million of its 12%, 15-year senior notes to an institutional investor. Proceeds will be used to repay a bank debt.

Saber Energy (Houston, Tex.) secured a $250 million working capital line of credit.

MGF Oil refinanced its existing secured bank debt for 2 years.

**Contracts.** Aramco awarded 2 engineering construction contracts for work in the Marjan Field off Saudi Arabia to Brown & Root.

National Supply's well control systems division was awarded a multi-million dollar contract from Union Oil of Thailand for the production of offshore platform wellhead equipment.

**Briefs.** Texas Gas Corp. changed their name to Texas Gas Resources Corp.

Foster Wheeler Corp. formed a new unit called Foster Wheeler Energy Resources. ■

AN HBJ ENERGY PUBLICATION

AUGUST 1983

# PIPELINE & GAS JOURNAL

ENERGY CONSTRUCTION, TRANSPORTATION & DISTRIBUTION

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## The P&GJ 500

## Details On The 500 Leading Companies Transporting Energy Through Pipelines

# PIPELINE & GAS JOURNAL

*International Pipeline & Gas Utility Design, Construction & Operation*

*Published Continuously Since 1859*

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P&GJ presentation editor James Duke, an artist and illustrator who likes for his work to convey a message as well as inform his audience, worked long and diligently to produce this month's P&GJ 500 striking cover; for more details on this elite group, see page 19.

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Operating costs have been reduced and valuable data produced by Greater Winnipeg Gas Company using a digital control system; system was recently given severe test by one of Winnipeg's coldest winters.

# The 3rd P&GJ 500

## Dimensions Of The 500 Leading Companies Transporting Energy Through Pipelines

by **Dean Hale**, *Editor;* **Jim Watts**, *Assistant Editor; and* **Denise Luttrall**, *Editorial Assistant*

Decreased energy demand, lessened economic activity, increases in energy prices, and continuing changes in energy flow patterns had noticeable effects on the nation's 500 leading firms that move hydrocarbon energy through pipelines. Results of 1982 activities are evident in data provided by the firms for the P&GJ 500 Report.

The third (1983) edition of the P&GJ 500 Report gives a definitive reading on the dimensions of the nation's energy pipeline network—covering some 2300 owner/operator entities and nearly 1,500,000 miles of gas transmission and gathering pipelines, liquids pipelines, and gas mains and services.

Included in the Third P&GJ 500 Report are the 300 leading gas distribution utilities, the 100 leading gas transmission and gathering pipeline systems (both interstate and intrastate), and the 100 leading liquids (crude oil and refined products) pipelines. These firms represent the industry's leaders—they serve 96.3% of the nation's gas utility customers, operate 88.5% of the nation's gas pipeline mileage, and operate 73.7% of the nation's liquids pipelines.

The P&GJ 500 Report provides details on revenues, gas sales (in MMcf per year), number of customers, net income, plant value, capital expenditures in terms of plant additions, and physical facilities in terms of miles of gas mains and services or miles of pipelines, as well as barrels of product delivered by liquids lines.

**Gas Distribution Utilities.** The leading 300 gas distribution utilities range in size from 3,896,369 customers to 3564 customers. The top 300 operate 84.3% of the nation's gas mains and 96.1% of its gas service lines, in terms of mileage. The top 10 gas utilities alone serve 35.6% of all of the nation's gas customers, and operate 25.7% of the total miles of mains and 32.4% of the total miles of service lines. For the third year, the two largest utilities were in California—Southern California Gas Co. and Pacific Gas & Electric Co. In the top 10 utilities, gas sales in 1982 were down 7.46%, while revenues increased 11% (up $2,077,000). Gas main mileage for the top 10 increased only 124 miles.

**Gas Transmission Pipelines.** The top 10 gas transmission pipeline companies (see tables) reported an increase of 15.2% in revenues ($4.430 billion) while gas sales declined 6.96% (689,984 MMcf) for the year. Additions to plan in 1982 by the top 10 were down 5.3% ($102 million). In 1982, El Paso Natural Gas Co. again ranked first in revenues, but fell to fifth in gas sales, sixth in plant additions, and second in total mileage. Tennessee Gas Pipe Line Co. ranked second in revenues and first in gas sales, fourth in plant additions, and fourth in total mileage. Columbia Gas Transmission Co. ranked third in revenues, seventh in gas sales, third in plant additions, and third in total mileage. Transcontinental Gas Pipe Line Corp. was fourth in revenues, sixth in gas sales, first in plant additions, and tenth in total mileage.

**Liquids Pipelines.** Revenues for liquids pipelines were up again in 1982 even though the total barrels of products and crude oil handled declined. The top 10 liquids pipeline companies registered a 5.3% increase in revenues, while the total deliveries of the top 10 crude oil pipelines declined 7% and deliveries of refined products by the top 10 products pipeline companies declined 3.6%. Plant additions by all liquids pipelines were down 42% for the year (compared to 1981 plant additions, when several major systems were completed).

The following summary tables provide an overview of the "top 10" companies in numerous categories; the complete tabular presentation gives a more complete dimensional measure of the P&GJ 500 companies in the three categories.

### The 10 Biggest Spenders— Gas Distribution Utilities (not including integrated companies)

| Rank 82 | Rank 83 | Company Name | 1982 Additions To Plant, $(000) |
|---|---|---|---|
| 1 | 1 | Southern California Gas Co. | 156,998 |
| — | 2 | Columbia Gas Distribution Co.'s | 100,000 |
| 5 | 3 | Public Service Electric & Gas Co. | 77,378 |
| — | 4 | South Carolina Electric & Gas Co. | 71,947 |
| 4 | 5 | Northern Illinois Gas Co. | 67,794 |
| 2 | 6 | Consolidated Gas Distribution Co.'s | 59,004 |
| 7 | 7 | Brooklyn Union Gas Co. | 55,048 |
| 3 | 8 | Washington Gas Light Co. | 54,801 |
| — | 9 | Kansas Nebraska Natural Gas Co. Inc. | 52,279 |
| 8 | 10 | Peoples Gas Light & Coke Co. | 52,050 |

### The 10 Biggest Spenders— Gas Transmission Pipelines (not including integrated companies)

| Rank 82 | Rank 83 | Company Name | 1982 Additions To Plant, $(000) |
|---|---|---|---|
| — | 1 | Transcontinental Gas Pipe Line Corp. | 278,719 |
| 2 | 2 | Michigan Wisconsin Pipeline Co. | 255,161 |
| 1 | 3 | Columbia Gas Transmission Co. | 216,271 |
| 3 | 4 | Tennessee Gas Pipeline Co. | 193,495 |
| 6 | 5 | Texas Eastern Transmission Corp | 180,238 |
| 7 | 6 | El Paso Natural Gas Co. | 163,772 |
| — | 7 | Texas Oil and Gas Corp. | 150,361 |
| 5 | 8 | Northern Natural Gas Co. | 143,659 |
| — | 9 | Natural Gas Pipeline Co. of America | 127,557 |
| 9 | 10 | Southern Natural Gas Co. | 114,559 |

### The 10 Biggest Spenders— Liquids Pipeline Companies

| Rank 82 | Rank 83 | Company Name | 1962 Additions To Plant, $(000) |
|---|---|---|---|
| 5 | 1 | Four Corners Pipe Line Co. | 32,468 |
| — | 2 | Ohio River Pipe Line Co. | 24,680 |
| 8 | 3 | Kaneb Pipe Line Co. | 23,527 |
| — | 4 | Loop Inc.* | 21,704 |
| 2 | 5 | MAPCO, Inc. | 21,046 |
| — | 6 | Chevron Pipe Line | 19,662 |
| 9 | 7 | Arco Pipe Line Co. | 19,090 |
| — | 8 | Williams Pipe Line | 17,183 |
| 10 | 9 | Sohio Pipe Line Co. | 16,932 |
| 6 | 10 | Exxon Pipeline Co. | 13,437 |

*Operations began January 1, 1982.

# The P&GJ 500 ... dimensions of the pipeline energy business

### The Top 10 In Revenues— Gas Distribution Utilities

| Rank | | | |
|---|---|---|---|
| 82 | 83 | Company Name | 1982 Revenues $(000) |
| 2 | 1 | Southern California Gas Co. | 4,304,068 |
| 1 | 2 | Public Service Electric & Gas Co. | 3,873,976 |
| 4 | 3 | Pacific Gas & Electric Co. | 3,607,404 |
| 3 | 4 | Columbia Gas Distribution Co.'s | 2,788,784 |
| 5 | 5 | Lone Star Gas Co. Div of Enserch | 2,151,374 |
| 6 | 6 | Northern Illinois Gas Co. | 1,815,530 |
| 7 | 7 | Consolidated Gas Distribution Co.'s | 1,667,859 |
| 8 | 8 | Michigan Consolidated Gas Co. | 1,638,666 |
| — | 9 | San Diego Gas & Electric Co. | 1,430,948 |
| 10 | 10 | Peoples Gas Light & Coke Co. | 1,401,011 |

### The Top 10 Gas Distribution Utilities In Miles of Mains

| Rank | | | |
|---|---|---|---|
| 82 | 83 | Company Name | Miles of Mains |
| 1 | 1 | Southern California Gas Co. | 35,309 |
| 3 | 2 | Columbia Gas Distribution Co.'s | 30,039 |
| 2 | 3 | Pacific Gas & Electric Co. | 29,955 |
| 4 | 4 | Northern Illinois Gas Co. | 23,646 |
| 5 | 5 | Entex Inc. | 21,920 |
| 6 | 6 | Consolidated Gas Distribution Co.'s | 20,526 |
| — | 7 | Lone Star Gas Co. | 19,710 |
| 7 | 8 | Consumers Power Co. | 19,467 |
| — | 9 | National Fuel Gas Distribution Corp. | 18,021 |
| 8 | 10 | Atlanta Gas Light Co. | 17,830 |

### The Top 10 In Revenues— Gas Transmission Pipelines

| Rank | | | |
|---|---|---|---|
| 82 | 83 | Company Name | 1982 Revenues $(000) |
| 1 | 1 | El Paso Natural Gas Co. | 4,054,407 |
| 4 | 2 | Tennessee Gas Pipe Line Co. | 3,947,222 |
| 2 | 3 | Columbia Gas Transmission Co. | 3,856,735 |
| 3 | 4 | Transcontinental Gas Pipe Line Corp. | 3,652,623 |
| 6 | 5 | Pacific Gas & Electric Co. | 3,607,423 |
| 5 | 6 | United Gas Pipe Line Co. | 3,436,000 |
| 8 | 7 | Texas Eastern Transmission Corp. | 3,146,927 |
| 7 | 8 | Natural Gas Pipeline Co. of America | 2,938,324 |
| 9 | 9 | Michigan Wisconsin Pipeline Co. | 2,455,008 |
| — | 10 | Northern Natural Gas Co. | 2,436,213 |

### The Top 10 Gas Distribution Utilities In MMcf Gas Sales

| Rank | | | |
|---|---|---|---|
| 82 | 83 | Company Name | 1982 Sales, MMcf |
| 2 | 1 | Southern California Gas Co. | 879,974 |
| 3 | 2 | Pacific Gas & Electric Co. | 722,814 |
| 1 | 3 | Columbia Gas Distribution Co.'s | 548,594 |
| 4 | 4 | Lone Star Gas Co. | 495,015 |
| 5 | 5 | Northern Illinois Gas Co. | 460,864 |
| 6 | 6 | Consolidated Gas Distribution Co.'s | 427,655 |
| 7 | 7 | Michigan Consolidated Gas Co. | 340,424 |
| 9 | 8 | Arkla Inc. | 301,748 |
| 10 | 9 | Peoples Gas Light & Coke Co. | 292,494 |
| 8 | 10 | Consumers Power Co. | 291,796 |

### The Top 10 Gas Transmission Pipelines In MMcf Gas Sales

| Rank | | | |
|---|---|---|---|
| 82 | 83 | Company Name | 1982 Sales, MMcf |
| 2 | 1 | Tennessee Gas Pipeline Co. | 1,034,546 |
| 6 | 2 | Natural Gas Pipeline Co. of America | 1,030,673 |
| 4 | 3 | United Gas Pipe Line Co. | 1,029,592 |
| 5 | 4 | Houston Natural Gas Corp. | 1,025,051 |
| 1 | 5 | El Paso Natural Gas Co. | 1,018,510 |
| 8 | 6 | Transcontinental Gas Pipe Line Corp. | 936,267 |
| 3 | 7 | Columbia Gas Transmission Co. | 932,768 |
| 7 | 8 | Texas Eastern Transmission Corp. | 884,663 |
| 9 | 9 | Pacific Gas & Electric Co. | 683,682 |
| 10 | 10 | Northern Natural Gas Co. | 652,218 |

### The Top 10 Gas & Electric Utilities— by Gas Customers

| Rank | | | | | |
|---|---|---|---|---|---|
| 82 | 83 | Company Name | No. of Customers | 1982 MMcf Sales | Miles of Mains |
| 1 | 1 | Pacific Gas & Electric Co. | 2,914,970 | 722,814 | 29,955 |
| 2 | 2 | Public Service Electric & Gas Co. | 1,319,745 | 200,455 | 12,625 |
| 3 | 3 | Consumers Power Co. | 1,168,058 | 291,796 | 19,467 |
| 4 | 4 | Consolidated Edison Co. of N.Y. | 1,016,146 | 98,551 | 4,191 |
| 5 | 5 | Public Service Co. of Colo. | 694,780 | 156,997 | 10,854 |
| 6 | 6 | Northern Indiana Public Serv. Co. | 528,883 | 246,367 | 9,436 |
| 7 | 7 | San Diego Gas & Electric Co. | 520,136 | 45,740 | 5,127 |
| 8 | 8 | Baltimore Gas & Electric Co. | 513,006 | 96,790 | 4,257 |
| 9 | 9 | Niagara Mohawk Power Co. | 428,453 | 109,693 | 5,968 |
| 10 | 10 | Long Island Lighting Co. | 397,930 | 49,576 | 5,878 |

## The 10 Largest Integrated Gas Utilities

| Rank | | | | | | | |
|---|---|---|---|---|---|---|---|
| 82 | 83 | Name of Company | No. of Customers | MMcf Sales | Miles of Mains | Miles of Trans. Lines | Additions to Plant $(000), 1982 |
| 1 | 1 | Pacific Gas & Electric Co. | 2,914,970 | 722,814 | 29,955 | 4,833 | 91,106 |
| 2 | 2 | Lone Star Gas Co., Div. of Enserch | 1,195,703 | 495,015 | 19,710 | 10,767 | 63,026 |
| 3 | 3 | Consumers Power Co. | 1,168,058 | 291,796 | 19,467 | 1,959 | 71,578 |
| 4 | 4 | Michigan Consolidated Gas Co. | 1,045,518 | 340,424 | 12,795 | 2,347 | 56,976 |
| 5 | 5 | Arkla, Inc. | 712,726 | 301,748 | 14,914 | 9,194 | 85,800 |
| 6 | 6 | National Fuel Gas Dist. Corp. | 671,023 | 205,965 | 18,021 | 1,464 | 68,456 |
| 7 | 7 | Oklahoma Natural Gas Co. (ONEOK, Inc.) | 617,660 | 264,913 | 10,500 | 4,751 | 41,196 |
| 8 | 8 | Mountain Fuel Supply Co. | 414,624 | 116,973 | 8,878 | 1,971 | 117,917 |
| 9 | 9 | Southwest Gas Corp. | 353,865 | 78,279 | 6,844 | 1,683 | 8,811 |
| 10 | 10 | Pioneer Corp. (Energas, Westar) | 284,941 | 195,300 | 4,262 | 4,218 | 41,915 |

# The P&GJ 500 ... dimensions of the pipeline energy business

### The Top Liquids Pipeline Companies—In Mileage

| Rank 82 | Rank 83 | Company Name | Total Miles Of Pipeline |
|---|---|---|---|
| 1 | 1 | Amoco Pipeline Co. | 12,190 |
| 2 | 2 | Mobil Pipe Line Co. | 11,809 |
| 3 | 3 | Exxon Pipeline Co. | 9,116 |
| 4 | 4 | Arco Pipe Line Co. | 8,248 |
| 5 | 5 | Williams Pipe Line Co. | 8,107 |
| 7 | 6 | MAPCO, Inc. | 8,025 |
| 8 | 7 | Continental Pipeline Co. | 7,330 |
| 6 | 8 | Shell Pipe Line Co. | 7,068 |
| 9 | 9 | Phillips Pipe Line Co. | 6,655 |
| 10 | 10 | Colonial Pipeline Co. | 5,250 |

### The Top 10 Products Pipeline Companies

| Rank 82 | Rank 83 | Company Name | 1982 Deliveries (000) Bbl Products |
|---|---|---|---|
| 1 | 1 | Colonial Pipeline Co. | 625,922 |
| 3 | 2 | Buckeye Pipe Line Co. | 256,704 |
| 4 | 3 | Southern Pacific Pipe Line Co. | 230,450 |
| 5 | 4 | Gulf Pipeline Co. | 207,915 |
| 9 | 5 | Phillips Pipe Line Co. | 176,894 |
| 8 | 6 | Williams Pipe Line Co. | 164,072 |
| 7 | 7 | Plantation Pipeline Co. | 155,982 |
| — | 8 | Shell Pipe Line Co. | 148,844 |
| — | 9 | Arco Pipe Line Co. | 138,687 |
| — | 10 | Texas Eastern Products Pipeline Co. | 137,141 |

### The Top 10 Crude Pipelines

| Rank 82 | Rank 83 | Company Name | 1982 Deliveries (000) Bbl Crude |
|---|---|---|---|
| 1 | 1 | Arco Pipe Line Co. | 523,685 |
| 2 | 2 | Exxon Pipeline Co. | 447,573 |
| 3 | 3 | Lakehead Pipe Line Co. | 387,267 |
| 4 | 4 | Shell Pipe Line Co. | 378,487 |
| 5 | 5 | Amoco Pipeline Co. | 304,879 |
| 8 | 6 | Sohio Pipe Line Co. | 293,477 |
| 9 | 7 | Gulf Pipeline Co. | 258,698 |
| 10 | 8 | Mobil Pipe Line Co. | 253,457 |
| 7 | 9 | Texas Pipe Line Co. | 209,261 |
| — | 10 | Continental Pipe Line Co. | 166,692 |

### The Top 10 Liquids Pipelines—Revenues

| Rank 82 | Rank 83 | Company Name | 1982 Revenues $(000) |
|---|---|---|---|
| 1 | 1 | Sohio Pipe Line Co. | 1,204,846 |
| 2 | 2 | Arco Pipe Line Co. | 873,120 |
| 3 | 3 | Exxon Pipeline Co. | 820,590 |
| 4 | 4 | BP Pipeline Inc. | 576,974 |
| 5 | 5 | Colonial Pipeline Co. | 479,759 |
| 6 | 6 | Amoco Pipeline Co. | 174,507 |
| — | 7 | Lakehead Pipe Line Co. | 158,835 |
| 8 | 8 | Mobil Pipe Line Co. | 153,121 |
| 7 | 9 | Mobil Alaska Pipeline Co. | 152,021 |
| 10 | 10 | Shell Pipe Line Co. | 148,030 |

# The 300 Leading Gas Distribution Utilities

| Rank 82 | Rank 83 | Name of Company | Number Of Customers | 1982 Gas Sales, MMcf | 1982 Oper. Revenues $(000) | 1982 Net Income $(000) | Gas Plant Value $(000) 12-31-82 | Additions To Plant $(000) | Miles of Mains | Mile of Services |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1 | Southern California Gas Co. | 3,896,369 | 879,974 | 4,304,068 | 71,465 | 1,237,015 | 156,998 | 35,309 | 36,676 |
| 2 | 2 | Pacific Gas & Electric Co. | 2,914,970 | 722,814 | 3,607,424 | 810,178[B] | 1,491,417 | 91,106 | 29,955 | 23,797 |
| 3 | 3 | Columbia Gas Distribution Co.'s[P] | 1,900,004 | 548,594 | 2,788,784 | 40,000[E] | 700,000[E] | 100,000[E] | 30,039 | 21,590[E] |
| 4 | 4 | Consolidated Gas Distribution Co.'s[Q] | 1,487,330 | 427,655 | 1,667,859[R] | 47,377[R] | 841,123 | 59,004 | 20,526[A] | 20,012[A] |
| 5 | 5 | Northern Illinois Gas Co. | 1,455,456 | 460,864 | 1,815,530 | 80,726 | 1,664,802 | 67,794 | 23,646 | 19,241 |
| 6 | 6 | Public Service Electric & Gas Co. | 1,319,745 | 200,455 | 1,330,785 | 342,827[B] | 1,132,500 | 77,378 | 12,625 | 12,476 |
| 7 | 7 | Entex Inc.[C] | 1,220,919 | 197,888 | 1,194,423 | 47,657 | 499,420 | 39,207 | 21,920 | 12,784 |
| 8 | 8 | Lone Star Gas Co. | 1,195,703 | 495,015 | 2,151,374 | 34,972 | 840,121 | 63,026 | 19,710 | 11,387[E] |
| 9 | 9 | Consumers Power Co. | 1,168,058 | 291,796 | 1,222,129 | 76,427 | 1,275,830 | 33,467 | 19,467 | 11,019[E] |
| 10 | 10 | Brooklyn Union Gas Co.[F] | 1,064,539 | 107,353 | 850,933 | 39,980 | 721,778 | 55,048 | 3,825 | 5,237 |
| 11 | 11 | Michigan Consolidated Gas Co. | 1,045,518 | 340,424 | 1,638,666 | 20,793 | 831,003 | 56,976 | 12,795 | 9,244[E] |
| 12 | 12 | Consolidated Edison Co. of N.Y. Inc. | 1,016,146 | 98,551 | 600,000[E] | 492,551 | 562,056 | 48,098 | 4,191 | 2,594 |
| 13 | 13 | The Peoples Gas Light & Coke Co.[F] | 871,295 | 292,494 | 1,401,011 | 39,915 | 709,332 | 52,050 | 4,013 | 5,123 |
| 15 | 14 | Atlanta Gas Light Co.[F] | 849,415 | 225,254 | 965,496 | 10,549 | 578,750 | 46,771 | 17,830 | 15,045 |
| 14 | 15 | The Gas Service Co. | 849,395 | 187,844 | 811,991 | 5,062 | 402,541[G] | 24,899 | 13,037 | 5,561 |

*A 1981 Data*
*B Electric and gas combined*
*C FY ended 6-30-82*
*D Steam and gas combined*
*E Estimated*
*F FY ended 9-30-82*
*G Gross value*
*H Gas, steam, and electric combined*
*I FY ended 8-31-82*
*J Includes gas and oil producing properties*
*K FY ended 10-31-82*
*L FY ended 3-31-82*
*M FY ended 5-31-82*
*N Combined corporate information*
*O Does not include propane customers*
*P Eight utility companies included*
*Q Four utility companies included*
*R Does not include Hope Natural Gas Co.*
*S United Cities Gas Co. & Gas Light Co. of Columbus (Ga) merged in 1982*
*T Gas and water combined*
*U FY ended 7-31-82*

## The P&GJ 500 ... dimensions of the pipeline energy business

| Rank | | Name of Company | Number Of Customers | 1982 Gas Sales, MMcf | 1982 Oper. Revenues $(000) | 1982 Net Income $(000) | Gas Plant Value $(000) 12-31-82 | Additions To Plant $(000) | Miles of Mains | Mile of Services |
|---|---|---|---|---|---|---|---|---|---|---|
| 82 | 83 | | | | | | | | | |
| 16 | 16 | **Arkla Inc.** | 712,726 | 301,748 | 1,043,800[J] | 95,380 | 1,231,946 | 85,800 | 14,914 | 7,477[E] |
| 17 | 17 | **Public Service Co. of Colorado** | 694,780 | 156,997 | 618,814[B] | 116,076[H] | 342,280 | 21,119 | 10,854 | 6,554[E] |
| 18 | 18 | **National Fuel Gas Distr. Corp.[F]** | 671,023 | 205,965 | 997,549 | 32,579 | 848,432[G] | 68,456 | 18,021 | 5,728[E] |
| 19 | 19 | **Oklahoma Natural Gas Co.[I]** | 617,660 | 264,913 | 980,230 | 34,504 | 575,424 | 41,196 | 10,500 | 7,019 |
| 20 | 20 | **Minnegasco Inc.** | 571,466 | 152,005 | 692,588 | 20,099 | 376,943 | 24,841 | 8,003 | 5,391[E] |
| 21 | 21 | Washington Gas Light Co. | 568,250 | 111,455 | 682,829 | 21,089 | 720,039 | 54,801 | 6,767 | 8,033 |
| 22 | 22 | Laclede Gas Co.[F] | 539,275 | 116,586 | 594,671 | 19,190 | 248,817 | 21,428 | 6,124 | 5,804 |
| 23 | 23 | Philadelphia Gas Works[I] | 531,927 | 78,517 | 510,616 | 32,052 | 399,562 | 10,809 | 2,983 | 4,986[E] |
| 24 | 24 | Northern Indiana Public Service | 528,883 | 246,367 | 950,734 | 103,235[B] | 3,232,296[G] | 48,595 | 9,436 | 10,039 |
| 25 | 25 | San Diego Gas & Electric Co. | 520,136 | 45,740 | 1,430,948[B] | 157,303 | 275,372 | 19,255 | 5,127 | 4,145 |
| 26 | 26 | **Baltimore Gas and Electric Co.** | 513,006 | 96,790 | 1,595,472[B] | 174,805 | 361,047 | 15,137 | 4,257 | 4,324 |
| 27 | 27 | **Boston Gas Co.** | 480,157 | 83,655 | 561,001 | 11,168 | 325,425 | 11,264 | 5,665 | 4,196 |
| 28 | 28 | **Niagara Mohawk Power Corp.** | 428,453 | 109,693 | 533,122 | 268,534[B] | 458,315 | 32,422 | 5,968 | 4,027 |
| 30 | 29 | **Mountain Fuel Supply Co.** | 414,624 | 116,973 | 510,340 | 55,019 | 431,238 | 45,467 | 8,878 | 4,876 |
| 29 | 30 | **Wisconsin Gas Co.** | 408,977 | 117,100 | 599,469 | 15,098 | 216,623 | 17,256 | 5,984 | 4,613 |
| 31 | 31 | Long Island Lighting Co. | 397,930 | 49,576 | 310,919 | 27,063 | 340,383 | 21,603 | 5,878 | 4,282[E] |
| 32 | 32 | Illinois Power Co. | 382,097 | 100,697 | 1,106,775[B] | 156,395[B] | 357,106 | 16,651 | 7,198 | 5,156 |
| 36 | 33 | Southern Union Gas Co. | 354,113 | 49,792 | 250,501 | 19,634 | 131,857 | 14,889 | 6,222 | 2,563 |
| 34 | 34 | Southwest Gas Corp. | 353,865 | 78,279 | 399,116 | 3,042 | 223,927[G] | 8,811 | 6,844 | 3,338[E] |
| 33 | 35 | Alabama Gas Corp.[F] | 352,323 | 75,600 | 339,548 | 6,783 | 118,692 | 11,452 | 6,142 | 7,004 |
| 35 | 36 | **Arizona Public Service Co.** | 339,443 | 39,739 | 197,967 | 231,043 | 114,319[E] | 8,831[E] | 6,180 | 3,904 |
| 37 | 37 | **Indiana Gas Co. Inc.** | 305,018 | 90,110 | 336,335 | 9,304 | 232,732 | 29,897 | 6,221 | 4,512 |
| 38 | 38 | **The Cincinnati Gas & Electric Co.** | 301,226 | 81,442 | 1,165,108[B] | 130,483 | 200,232 | 9,992 | 3,466 | 811 |
| 40 | 39 | **Peoples Natural Gas Div., InterNorth** | 299,589 | 129,881 | 515,965 | 11,240 | 144,426 | 15,139 | 9,859 | 3,337 |
| 39 | 40 | **Philadelphia Electric Co.** | 297,872 | 68,761 | 390,427 | 24,417 | 397,343 | 25,449 | 4,430 | 3,099 |
| 43 | 41 | Northern States Power Co. | 291,100 | 74,645 | 373,277 | N/A | 268,313 | 13,733 | 4,330 | 3,185 |
| 42 | 42 | Gas Co. of New Mexico | 290,312 | 72,978 | 338,952 | 4,707 | 195,778 | 16,919 | 6,296 | 1,396 |
| 41 | 43 | Energas[N] (Pioneer Corp.) | 284,728 | 76,076 | 257,572 | N/A | 44,479 | 7,475 | 10,708 | 5,393[E] |
| 44 | 44 | San Antonio City Public Service | 271,393 | 27,764 | 139,618 | 80,477 | 153,178 | 7,766 | 3,439 | 3,021 |
| 45 | 45 | Dayton Power & Light Co. | 264,258 | 53,802 | 272,094 | N/A | 122,919 | 7,741 | 3,888 | 739 |
| 46 | 46 | **Equitable Gas Co.** | 259,594 | 65,820 | 342,598 | 33,648 | 442,011 | 25,888 | 3,349 | 2,449[E] |
| 48 | 47 | **Washington Natural Gas Co.[F]** | 252,095 | 56,337 | 360,400 | 12,374 | 314,573 | 21,866 | 6,035 | 6,028 |
| 47 | 48 | **Northwest Natural Gas Co.** | 246,357 | 60,477 | 367,544 | 17,691 | 298,718 | 26,363 | 7,629 | 4,641 |
| 52 | 49 | **New Jersey Natural Gas Co.[F]** | 238,146 | 50,574 | 257,132 | 8,346 | 138,729 | 13,391 | 4,384 | 3,820 |
| 50 | 50 | **Louisiana Gas Service Co.[F]** | 233,871 | 20,186 | 101,524 | 391 | 68,253 | 7,663 | 3,696 | 2,302 |
| 49 | 51 | Louisville Gas & Electric Co. | 233,006 | 52,005 | 210,822 | 43,175[B] | 94,846 | 855 | 850 | 2,841 |
| 51 | 52 | Memphis Light, Gas & Water | 231,032 | 61,319 | 244,732 | 7,236 | 160,295[G] | 7,622 | 926 | 2,221 |
| 53 | 53 | Rochester Gas & Electric Corp. | 230,908 | 46,767 | 681,913 | 70,040 | 203,202 | 9,769 | 3,575 | 2,803 |
| 54 | 54 | Iowa-Illinois Gas & Electric Co. | 223,967 | 65,434 | 267,547 | 54,497[B] | 183,334 | 4,607 | 3,635 | 2,612 |
| 55 | 55 | Bay State Gas Co. | 220,849 | 44,845 | 312,107 | 6,078 | 229,178 | 12,050 | 2,295[E] | 2,083[E] |
| 56 | 56 | **Wisconsin Natural Gas Co.** | 217,986 | 65,726 | 327,701 | 10,246 | 152,253 | N/A | 4,201 | 2,812[E] |
| 58 | 57 | **Citizens Gas & Coke Utility** | 212,103 | 53,127 | 228,004 | (8,931) | 236,619 | 18,266 | 2,986 | 4,184 |
| 59 | 58 | **UGI Corp.** | 206,042 | 60,128 | 334,064 | 20,134 | 210,220 | 22,655 | 3,263 | 1,988 |
| 60 | 59 | **Mississippi Valley Gas Co.[F]** | 204,422 | 57,011 | 218,384 | 3,658 | 50,296 | N/A | 4,299 | 2,105[E] |
| 62 | 60 | **Piedmont Natural Gas Co.[K]** | 201,151 | 64,592 | 315,774 | 7,372 | 230,496 | 10,865 | 5,334 | 1,898[E] |

# The P&GJ 500 ... dimensions of the pipeline energy business

| Rank | | Name of Company | Number Of Customers | 1982 Gas Sales, MMcf | 1982 Oper. Revenues $(000) | 1982 Net Income $(000) | Gas Plant Value $(000) 12-31-82 | Additions To Plant $(000) | Miles of Mains | Mile of Services |
|---|---|---|---|---|---|---|---|---|---|---|
| 82 | 83 | | | | | | | | | |
| 61 | 61 | **Commonwealth Gas Co.** | 200,046 | 39,803 | 246,249 | 1,161 | 138,781[G] | 7,559 | 2,357 | 1,572 |
| 57 | 62 | **Kansas-Nebraska Natural Gas Co.** | 197,328 | 93,500 | 488,319 | 26,452 | 520,988 | 52,279 | 3,636 | 2,242[E] |
| 62 | 63 | **Elizabethtown Gas Co.** | 194,959 | 39,755 | 252,873 | 9,450 | 107,816 | 9,953 | 2,134 | 4,656 |
| 69 | 64 | **South Carolina Electric & Gas Co.** | 186,309 | 45,718 | 266,389 | 7,324 | 252,077 | 71,947 | 5,770 | 4,033 |
| 64 | 65 | **Central Illinois Light Co.** | 183,871 | 46,361 | 480,508[B] | 41,913 | 203,196 | 11,912 | 3,205 | 2,795 |
| 66 | 66 | New Orleans Public Service Inc. | 174,933 | 22,580 | 121,008 | (1,180) | 46,707 | 2,525 | 1,460 | 2,642 |
| 68 | 67 | Montana-Dakota Utilities Co. | 174,590 | 63,112 | 253,183 | 2,578 | 271,277[G] | 24,487 | 3,293 | 2,612[E] |
| 67 | 68 | Peoples Gas System Inc. (Tampa) | 169,208 | 37,395 | 166,179 | 5,397 | 146,101 | 8,877 | 4,200 | 2,612 |
| 72 | 69 | Public Service of N.C. Inc. | 155,447 | 41,863 | 211,793 | 7,000 | 130,674 | 15,428 | 3,566 | 1,766[E] |
| 71 | 70 | Wisconsin Public Service Corp. | 153,140 | 47,515 | 584,477[B] | 41,907 | 113,143[G] | 6,996 | 2,774 | 2,046 |
| 70 | 71 | **Northeast Utilities** | 152,329 | 28,902 | 224,447 | 18,647 | 224,460 | 22 | 2,265 | 1,160[E] |
| 64 | 72 | **Central Illinois Public Service Co.** | 150,328 | 33,255 | 138,369 | 66,344[B] | 101,127 | 5,380 | 1,327 | 2,597 |
| 73 | 73 | **Western Kentucky Gas Co.** | 138,814 | 37,326 | 153,873 | 3,990 | 48,404 | 1,137 | 2,860 | 881 |
| 76 | 74 | **The Kansas Power & Light Co.** | 133,409 | 48,975 | 149,214 | 4,074 | 63,867 | 10,693 | 4,291 | 621 |
| 75 | 75 | **Iowa Power & Light Co.** | 133,294 | 31,677 | 142,245 | 5,919 | 102,719 | 12,557 | 2,204 | 2,024 |
| 80 | 76 | South Jersey Gas Co. | 131,936 | 38,799 | 218,499 | 6,178 | 120,977 | 15,822 | 3,393 | 2,358 |
| 77 | 77 | The Southern Connecticut Gas Co. | 131,825 | 20,277 | 131,085 | 6,897 | 125,950[G] | 9,534 | 1,778 | 2,001 |
| 78 | 78 | Iowa Electric Light & Power Co. | 131,638 | 36,377 | 402,847[B] | 27,412[B] | 64,484 | 3,752 | 2,120 | 1,971 |
| 79 | 79 | New York State Electric & Gas Corp. | 129,980 | 36,966 | 184,997 | 145,095 | 95,839 | 7,241 | 3,869 | 1,460 |
| 81 | 80 | Metropolitan Util. District (Omaha) | 129,954 | 33,362 | 131,557 | 3,724 | 106,212 | 4,916 | 1,711 | 1,947 |
| 74 | 81 | **Long Beach Gas Dept.[C]** | 127,033 | 30,146 | 117,400 | 11,100 | 52,382 | 1,575 | 892 | 1,444[E] |
| 83 | 82 | **Connecticut Natural Gas Co.** | 125,125 | 25,456 | 176,075 | 6,806 | 134,033 | 10,769 | 1,576 | 1,422[E] |
| 84 | 83 | **Virginia Natural Gas, Div. VEPCO** | 123,474 | 18,810 | 106,244 | N/A | 85,141 | 9,192 | 2,137 | 2,333 |
| 82 | 84 | **Iowa Public Service Co.** | 121,720 | 39,267 | 370,524[B] | 35,132 | 75,922 | 3,960 | 1,870 | 1,679 |
| 85 | 85 | **Providence Gas Co.[F]** | 120,535 | 21,938 | 149,545[B] | 4,598 | 65,196 | 5,583 | 1,677 | 1,193 |
| 109 | 86 | United Cities Gas Co.[S] | 114,773 | 21,239 | 101,748 | 1,224 | 79,481 | 22 | 2,333 | 2,027 |
| 86 | 87 | Pennsylvania Gas & Water Co. | 112,816 | 32,833 | 165,652[T] | 7,707 | 139,108 | 8,774 | 1,300 | 708 |
| 88 | 88 | Michigan Energy Resources Co. | 105,988 | 34,072 | 161,025 | 3,505 | 114,766 | 5,734 | 2,573 | 2349 |
| 89 | 89 | Wisconsin Power & Light | 103,469 | 24,812 | 138,388 | 47,355[B] | 99,949 | -7,280 | 2,124 | 1,175[E] |
| 88 | 90 | Montana Power Co. | 102,354 | 38,250 | 362,796 | 70,586 | 272,772 | 12,709 | 1,801 | 1,953 |
| 90 | 91 | **North Shore Gas Co.** | 97,756 | 33,512 | 154,784 | 6,412 | 110,762 | 245 | 1,660 | 1,520 |
| 92 | 92 | **City Gas of Florida[L]** | 94,575 | 7,452 | 43,704 | 2,542 | 46,652 | 4,578 | 3,028 | 1,077[E] |
| 93 | 93 | **Intermountain Gas Co.[F]** | 94,204 | 26,694 | 147,628 | 3,658 | 72,900 | 3,588 | 3,998 | 1,757 |
| 95 | 94 | **Colonial Gas Co.** | 90,182 | 15,106 | 115,715 | 3,076 | 85,818 | 8,089 | 1,991 | 1,024[E] |
| 94 | 95 | **Orange & Rockland Utilities** | 89,835 | 23,912 | 479,357[B] | 34,126 | 71,361 | 2,786 | 1,491 | 1,240 |
| 98 | 96 | Colorado Springs DPU | 87,969 | 18,121 | 84,520 | (1,336) | 43,069 | 4,142 | 205 | 118 |
| 96 | 97 | Mobile Gas Service Co.[F] | 86,728 | 151,240 | 74,500 | 2,487 | 33,660 | 3,189 | 1,241 | 1,608 |
| 97 | 98 | Gulf States Utilities Co. | 85,394 | 8,536 | 43,111 | 1,761 | 31,665 | 1,722 | 1,339 | 1,183 |
| 99 | 99 | North Carolina Natural Gas[A] | 83,124 | 43,422 | 179,678 | 4,404 | 53,126 | 6,396 | 1,065[E] | 791[E] |
| 100 | 100 | Cascade Natural Gas Corp. | 82,551 | 32,714 | 193,194 | 3,191 | 153,431 | 7,914 | 2,857 | 1,407 |
| 101 | 101 | **Washington Water Power Co.** | 76,812 | 24,252 | 346,853[B] | 59,388 | 59,409 | 1,368 | 2,175 | 1,293 |
| 102 | 102 | **Delmarva Power & Light Co.** | 74,598 | 15,604 | 84,747 | 5,800 | 66,094 | 2,231 | 1,022 | 847[E] |
| 103 | 103 | **Arkansas Western Gas Co.** | 71,986 | 18,233 | 58,384 | 201 | 44,153 | 6,499 | 1,487[E] | 818[E] |
| 104 | 104 | **City of Richmond, Va.[C]** | 70,606 | 14,387 | 73,787 | 1,926 | 36,925 | 3,685 | 317[E] | 666[E] |
| 105 | 105 | **Michigan Power Co.** | 69,282 | 21,177 | 98,545 | 1,132 | 45,134 | 145 | 1,541 | 787[E] |

# The P&GJ 500 ... dimensions of the pipeline energy business

| Rank 82 | Rank 83 | Name of Company | Number Of Customers | 1982 Gas Sales, MMcf | 1982 Oper. Revenues $(000) | 1982 Net Income $(000) | Gas Plant Value $(000) 12-31-82 | Additions To Plant $(000) | Miles of Mains | Mile of Services |
|---|---|---|---|---|---|---|---|---|---|---|
| 107 | 106 | **Madison Gas & Electric Co.** | 68,514 | 15,531 | 189,204[B] | 14,956[B] | 62,646 | 4,369 | 1,258 | 965 |
| 106 | 107 | **Nashville Gas Co.** | 67,679 | 18,927 | 84,596 | (677) | 54,351 | 3,487 | 1,417 | 769[E] |
| 108 | 108 | **TransLouisiana Gas Co. Inc.[A]** | 67,608 | 35,979 | 135,290 | 2,789 | 32,911 | 3,916 | 1,037[E] | 644[E] |
| 113 | 109 | **Rio Grande Valley Gas Co.** | 66,457 | 6,584 | 38,278 | 1,826 | 32,067 | 1,661 | 1,675 | 223 |
| 110 | 110 | **Southeastern Michigan Gas Co.** | 66,407 | 14,443 | 67,286 | 2,220 | 75,839 | 803 | 1,326 | 755[E] |
| 111 | 111 | Associated Natural Gas Co. | 65,824 | 11,516 | 52,068 | 790 | 21,561 | 1,200 | 692[E] | 621[E] |
| 112 | 112 | Greeley Gas Co.[A] | 65,220 | 12,019 | 44,472 | — | — | — | 1,454 | 750 |
| 114 | 113 | Northwestern Public Service Co. | 64,640 | 53,552 | 112,020[B] | 8,897[B] | 20,780 | 422 | 1,076 | 1,072[E] |
| 115 | 114 | Gasco Inc.[A] | 64,300[O] | 4,890 | 78,429 | 9,798[N] | 78,767[G] | 2,476 | 587 | 531 |
| 116 | 115 | Southern Indiana Gas & Elect. Co. | 63,078 | 19,123 | 225,561[B] | 20,883[B] | 38,277 | 2,440 | 1,052 | 717[E] |
| 119 | 116 | **North Central Public Service Co.** | 62,074 | 17,900 | 128,319 | 4,792 | 20,000[E] | 2,000[E] | 889 | 260 |
| 117 | 117 | **The Union Light, Heat & Power Co.** | 60,602 | 12,882 | 159,917 | 5,563 | 52,768 | 3,112 | 721 | 680[E] |
| 118 | 118 | **Corpus Christi Gas Division** | 57,517 | 5,406 | 28,428 | — | 20,000[E] | 250[E] | 553[E] | 543[E] |
| 120 | 119 | **Union Gas System Inc.[I]** | 54,396 | 12,604 | 45,608 | 609 | 11,255 | 1,036 | 2,810 | 572[E] |
| 124 | 120 | **Sierra Pacific Power Co.** | 53,975 | 7,696 | 50,136 | 38,505[B] | 35,597 | 2,816 | 603[E] | 430[E] |
| 121 | 121 | Arkansas Oklahoma Corp. | 53,957 | 12,084 | 31,470 | 1,332 | 36,821 | 4,047 | 589 | 403 |
| 123 | 122 | Springfield City Utilities[F] | 53,902 | 10,968 | 50,923[B] | 2,979[B] | 31,540 | 2,783 | 781 | 871 |
| 125 | 123 | CP National Corp. | 52,263 | 7,822 | 51,611 | 2,321 | 46,390 | 3,386 | 1,337 | N/A |
| 126 | 124 | Missouri Utilities Co. | 48,555 | 4,341 | 33,891 | 3,252 | 24,872 | 2,161 | 848 | 552[E] |
| 127 | 125 | Central Hudson Gas & Elect. Corp. | 47,187 | 9,837 | 61,649 | 35,329[B] | 58,322 | 3,228 | 708 | 456 |
| 128 | 126 | **Valley Resources Inc.[I]** | 46,363 | 6,477 | 44,881 | 1,222 | 21,508 | 1,239 | 488 | 335 |
| 130 | 127 | **Interstate Power Co.[A]** | 44,949 | 25,286 | 74,824 | 169 | 26,270 | 2,343 | 403 | 428 |
| 131 | 128 | **Energy Services of Pensacola[F]** | 43,600 | 4,192 | 29,550 | 4,997 | 14,068 | — | 944 | 619 |
| 133 | 129 | **Florida Public Utilities Co.** | 41,186 | 6,583 | 28,633 | 1,299[B] | 36,356[B,G] | N/A | 589 | 468[E] |
| 132 | 130 | **Fall River Gas Co.** | 40,790 | 5,883 | 42,107 | 1,326 | 17,118 | 737 | 439 | 425 |
| 134 | 131 | Missouri Public Service Co. | 39,990 | 9,177 | 38,864 | 16,245[B] | 27,551 | 1,270 | 863 | 493 |
| 135 | 132 | Iowa Southern Utilities Co.[A] | 39,968 | 9,026 | 35,180 | 298 | 14,139 | 774 | 658 | 558 |
| 136 | 133 | Wisconsin Fuel & Light Co. | 37,619 | 14,371 | 66,576 | 1,038 | 12,912 | 1,120 | 851 | 549 |
| 137 | 134 | Wisconsin Southern Gas Co. Inc. | 37,069 | 8,062 | 36,791 | 1,265 | 26,679 | 1,140 | 1,002 | 612 |
| 138 | 135 | Missouri Power & Light | 34,963 | 6,995 | 32,232 | 1,181 | 26,454 | 1,277 | 708 | 450 |
| 139 | 136 | **Terre Haute Gas Co.** | 33,172 | 15,293 | 60,226 | N/A | N/A | N/A | 704 | N/A |
| 140 | 137 | **Roankoe Gas Co.** | 31,845 | 7,607 | 39,535 | 901 | 15,193 | 151 | 413 | 300 |
| 141 | 138 | **Battle Creek Gas Co.** | 31,078 | 11,510 | 47,149 | 1,884 | 32,571 | 3,447 | 555 | 353[E] |
| 142 | 139 | **SE Alabama Gas District** | 30,362 | 7,230 | 30,056 | 1,288 | 25,884 | 542 | 773 | 552[E] |
| 143 | 140 | **North Penn Gas Co.** | 30,340 | 9,896 | 91,452 | 1,669 | 34,884 | 1,837 | 1,544 | 345[E] |
| 145 | 141 | Chattanooga Gas Co. | 29,389 | 21,317 | 93,462 | 1,[illegible]08 | 39,490 | 1,291 | 844 | 393[E] |
| 144 | 142 | Haverhill Gas Co.[A] | 29,285 | 4,519 | 27,860 | 1,001 | 21,029 | 3,005 | 283 | 279 |
| 150 | 143 | Kokomo Gas & Fuel Co.[A] | 28,320 | 11,093 | 36,463 | — | — | — | 544 | 444 |
| 146 | 144 | Delta Natural Gas. Co.[C] | 27,859 | 5,920 | 25,600 | 678 | 26,042[G] | 3,138 | 792[E] | 263[E] |
| 148 | 145 | Berkshire Gas Co.[A] | 27,393 | 5,551 | 28,083 | 1,163 | 21,754 | 2,956 | 562 | 320 |
| 149 | 146 | **Penn Fuel Gas Co.** | 27,375 | 17,232 | 44,898 | N/A | N/A | N/A | 285 | 258 |
| — | 147 | **Huntsville Util. Gas System[A]** | 26,103 | 5,574 | 22,103 | — | — | — | 535 | 399 |
| 152 | 148 | **Ohio Gas Co.** | 25,166 | 6,705 | 31,322 | 1,862 | 27,627 | 2,212 | 504 | 410 |
| 154 | 149 | **Alexandria Gas Dept.[A]** | 24,250 | 3,078 | 7,242 | — | — | — | 57 | 229[E] |
| 153 | 150 | **Ohio Valley Gas[A]** | 23,867 | 6,919 | 21,661 | — | — | — | 563 | 240 |

# The P&GJ 500 ... dimensions of the pipeline energy business

| Rank | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 82 | 83 | Name of Company | Number Of Customers | 1982 Gas Sales, MMcf | 1982 Oper. Revenues $(000) | 1982 Net Income $(000) | Gas Plant Value $(000) 12-31-82 | Additions To Plant $(000) | Miles of Mains | Mile of Services |
| 155 | 151 | Cheyenne Light Fuel & Power Co.[A] | 23,580 | 14,451 | 40,119 | — | — | — | 355 | 223 |
| 156 | 152 | City of Palo Alto[A] | 22,898 | 2,964 | 13,061 | 234 | 3,939 | 304 | 204 | 215 |
| 159 | 153 | City of Hamilton | 22,858 | 4.501 | 15,582 | — | — | — | 210 | 216[E] |
| 157 | 154 | City of Mesa[C] | 22,638 | 2,372 | 13,723 | 1955 | 13,805 | 2,522 | 530 | 278 |
| 158 | 155 | Great Falls Gas Co.[A] | 22,324 | 4,486 | 19,407 | 75 | 9,851 | 501 | 349 | 416 |
| 162 | 156 | Rocky Mountain Natural Gas | 21,743 | 4,848 | 21,653 | 518 | 25,972 | 3,202 | 426 | 399 |
| 161 | 157 | City of Duluth Dept. of Water & Gas | 21,211 | 4,640 | 22,912 | 1,083 | 22,798 | 1,780 | 418 | 250[E] |
| 164 | 158 | Austell Natural Gas System[U] | 21,174 | 3,985 | 18,649 | — | 15,130 | 368 | 488 | 429 |
| 160 | 159 | Willmut Gas & Oil[A] | 20,576 | 3,482 | 13,660 | — | — | — | 500 | 194 |
| 166 | 160 | Brazos River Gas Co. | 20,327 | 2,585 | 12,802 | 559 | 4,284 | 310 | 521 | 37 |
| 165 | 161 | Albany Water Gas & Light Comm.[A] | 20,271 | 5,200 | 19,000 | — | — | — | 335 | 191 |
| 168 | 162 | Inter-City Gas Corp. Inc.[A] | 19,761 | 11,809 | 50,965 | N/A | N/A | N/A | 415 | 320 |
| — | 163 | Gas Service Inc. (N.H.) | 19,622 | 4,103 | 22,290 | — | — | — | 410 | 223 |
| 167 | 164 | Knoxville Utilities Board | 19,607 | 6,706 | 25,819 | — | — | — | 652 | 388 |
| 175 | 165 | Okaloosa County Gas District | 18,642 | 2,179 | 12,401 | 465 | 12,427 | 153 | 580 | 501 |
| 170 | 166 | Northern Indiana Fuel & Light Co. Inc. | 18,291 | 4,995 | 21,898 | 761 | 17,062 | 963 | 478 | 208[E] |
| 176 | 167 | South Coast Gas Co.[C] | 18,185 | 1,636 | — | — | — | — | 486 | 242 |
| 173 | 168 | Gulf Natural Gas Co.[A] | 18,176 | 3,736 | — | — | — | — | 443 | 100 |
| 169 | 169 | Kansas Public Service Co.[A] | 17,766 | 3,450 | 10,967 | — | — | — | 258 | 174 |
| 171 | 170 | Great River Co.[A] | 17,749 | 5,796 | 22,360 | — | — | — | 444 | 167[E] |
| 172 | 171 | Union Electric Co. | 17,218 | 2,744 | 14,769 | 400 | 14,041 | 476 | 259 | 196[E] |
| 177 | 172 | Jackson Utility Division[A] | 16,064 | 5,145 | 14,104 | — | — | — | 381 | 156[E] |
| 178 | 173 | National Gas & Oil Corp. | 15,937 | 12,873 | 46,211 | 2,736 | 25,838 | 2,112 | 1,033 | 112 |
| 180 | 174 | Citizens Utilities[A] | 15,893 | 2,514 | 10,967 | — | — | — | 326 | 28 |
| 179 | 175 | Manchester Gas[F] | 15,404 | N/A | 15,967 | 579 | 12,281 | 1,035 | 194 | 178 |
| 181 | 176 | Northern Gas Co.[A] | 15,045 | 3,125 | 10,660 | — | — | — | 274 | 142[E] |
| 183 | 177 | Fitchburg Gas & Electric Light | 14,955 | 2,653 | 46,483[B] | 1,990[B] | 14,895 | 1,133 | 294 | 170[E] |
| 189 | 178 | Trussville Utilities Board[F] | 14,860 | 2,370 | 10,286[T] | 1,777 | 18,412 | 595 | 307 | 352 |
| 185 | 179 | City of Danville Gas Department[C] | 14,851 | 5,522 | 22,025 | 1,128 | 5,170 | 229 | 244 | 175 |
| 174 | 180 | Pennsylvania & Southern Gas[F] | 14,800 | 5,015 | 26,453 | 731 | 14,676 | 679 | 463 | 207 |
| 190 | 181 | Chesapeake Utilities Corp. | 14,750 | 1,980 | 11,740 | 1,934 | 10,489 | 792 | 312 | 168[E] |
| 184 | 182 | Las Cruces Gas System[A] | 14,657 | 1,554 | 7,000 | — | — | — | 302 | 138[E] |
| 193 | 183 | Gainesville Gas Co.[A] | 14,618 | 3,137 | — | — | — | — | 320 | 139[E] |
| 187 | 184 | Moran Utilities[A] | 14,060 | 1,473 | 10,691 | — | — | — | 287 | 96 |
| 188 | 185 | Houma Municipal Gas System[A] | 14,013 | 3,846 | — | — | — | — | 156 | 132[E] |
| 192 | 186 | Tennessee-Virginia Energy[A] | 13,666 | 8,644 | 42,126 | — | — | — | 573 | 129[E] |
| 191 | 187 | Great Plains Natural Gas[A] | 13,620 | 3,535 | 15,299 | — | — | — | 305 | 128[E] |
| — | 188 | Richmond Gas[A] | 13,568 | 3,812 | 12,734 | — | — | — | 213 | 153 |
| 195 | 189 | Vermont Gas Systems | 12,694 | 4,367 | 27,748 | 1,106 | 11,481 | 430 | 256 | 154 |
| 194 | 190 | Lancaster Municipal Gas Co.[A] | 12,664 | 2,105 | 8,606 | — | — | — | 231 | 191[E] |
| 197 | 191 | City of Warner Robbins Gas[A] | 12,035 | 5,643 | 6,858 | — | — | — | 191 | 114 |
| 196 | 192 | Charlottesville Gas Division | 12,032 | 2,376 | 13,759 | — | — | — | 182 | 165 |
| 198 | 193 | Corning Natural Gas Corp. | 11,840 | 12,515 | 52,551 | 671 | 8,229 | 605 | 82 | 238 |
| — | 194 | Ft. Hill Natural Gas Authority[A] | 11,564 | 2,908 | 13,396 | — | — | — | 630 | 131[E] |
| 199 | 195 | Hobbs Gas[A] | 11,561 | 1,520 | 5,931 | — | — | — | 250 | 132[E] |

# The P&GJ 500 ... dimensions of the pipeline energy business

| Rank 82 | Rank 83 | Name of Company | Number Of Customers | 1982 Gas Sales, MMcf | 1982 Oper. Revenues $(000) | 1982 Net Income $(000) | Gas Plant Value $(000) 12-31-82 | Additions To Plant $(000) | Miles of Mains | Mile of Services |
|---|---|---|---|---|---|---|---|---|---|---|
| — | 196 | Holyoke Gas & Electric[A] | 11,500 | 2,079 | 7,865 | — | — | — | 130 | 77 |
| 200 | 197 | Dalton Utilities[A] | 11,000 | 9,617 | — | — | — | — | 40 | 104 |
| 202 | 198 | Middle Tennessee Gas Util. Dist.[A] | 10,745 | 2,880 | 12,100 | — | — | — | 594 | 328 |
| 201 | 199 | Lake Superior District Power Co.[A] | 10,641 | 5,541 | 17,513 | — | — | — | 232 | 141 |
| 203 | 200 | Citizens Gas Fuel | 10,241 | 2,637 | 14,120 | 812 | 9,372 | 906 | 235 | 133[E] |
| 205 | 201 | Midwest Energy Inc. | 10,073 | 2,026 | 6,184 | 154 | 4,002 | 251 | 222 | 122[E] |
| 206 | 202 | Northeast Oklahoma Public Utilities[A] | 9,858 | — | — | — | — | — | 316 | 92 |
| 212 | 203 | City of Rocky Mount | 9,850 | 2,178 | N/A | N/A | 11,031 | 231 | 148 | 100 |
| 211 | 204 | Lynchburg Gas | 9,822 | 5,027 | 24,284 | 599 | 8,878 | 1,019 | 357 | 190 |
| 207 | 205 | Hastings Utilities[A] | 9,616 | 17 | 5,508 | — | — | N/A | 140 | 100 |
| 208 | 206 | Greenwood Public Works[A] | 9,582 | 2,831 | 12,045 | — | — | — | 283 | 143 |
| 209 | 207 | Marshall County Gas District[A] | 9,453 | 24 | 75 | — | — | — | 224 | 90 |
| 213 | 208 | Illinois Gas Co.[A] | 9,360 | 1,569 | 5,994 | — | — | — | 248 | 115 |
| 210 | 209 | Southern Public Service | 9,215 | 1,247 | 6,506 | 53 | 1,691 | 234 | 150 | 100 |
| 214 | 210 | Austin Utilities | 9,182 | 1,951 | 10,711 | 90 | 1,846 | 178 | 143 | N/A |
| — | 211 | Pascagoula Gas System[A] | 9,059 | N/A | N/A | N/A | N/A | N/A | 166 | 85[E] |
| 216 | 212 | City of Pleasant Grove[A] | 9,043 | 939 | 4,799 | 713 | 500 | 0 | 224 | 112 |
| 218 | 213 | Cedar Falls Utilities[A] | 8,968 | 1,446 | 5,830 | — | — | — | 132 | 132 |
| 217 | 214 | Superior Water, Light & Power Co. | 8,897 | 2,124 | 10,931 | 435 | 6,313 | 118 | 115 | 117 |
| — | 215 | Lake Apopka Natural Gas District[A] | 8,639 | — | — | — | — | — | 276 | 82 |
| 219 | 216 | City of LaGrange Gas Department[A] | 8,570 | 2,000 | 1,900 | — | — | — | 140 | 100 |
| 220 | 217 | Vicksburg Water & Gas[A] | 8,444 | 1,017 | 5,021 | — | — | — | 32 | 80 |
| 222 | 218 | Norco Gas & Fuel Co. Inc.[C] | 8,343 | 1,119 | 5706 | 87 | 2,500 | 194 | 189 | 95[E] |
| 215 | 219 | City of Florence Gas Department[F] | 8,128 | 5,274 | 5,718 | 44 | 4,221 | 0 | 270 | 242 |
| -- | 220 | Midwest Natural Gas | 8,051 | 18,042 | 5,819 | N/A | N/A | N/A | 18 | 122 |
| 225 | 221 | Orangeburg Dept. of Public Util.[F] | 7,997 | 3,106 | 12,332 | 1,319 | 3,686 | 73 | 198 | 80 |
| 226 | 222 | SW Texas Municipal Gas Corp.[A] | 7,358 | 268 | — | — | — | — | 163 | 70 |
| 223 | 223 | Tallahassee Municipal Gas System[A] | 7,318 | 1,420 | 6,593 | — | — | — | 236 | 70 |
| 224 | 224 | Norwich Department of Public Util. | 7,188 | 929 | 6,779 | 555 | 5,829 | 383 | 106 | 82[F] |
| 227 | 225 | Clinton-Newberry Gas Authority[A] | 7,112 | 9,295 | — | — | — | — | 500 | 135[E] |
| 234 | 226 | Peoples Natural Gas Co. of S.C. | 7,104 | 3,240 | 15,931 | 353 | 5,000 | 1,231 | 211 | 199 |
| 228 | 227 | Owatonna Public Utilities | 7,098 | 2,447 | 9,606 | 1,110 | 4,379 | 1,960 | 115 | 81[E] |
| 230 | 228 | Schagrin Gas[A] | 7,000 | — | — | — | — | — | 70 | 71[E] |
| 232 | 229 | City of Del Rio Gas System | 6,909 | 457 | 2,265 | 2,419 | N/A | N/A | 123 | 40 |
| 229 | 230 | Graysville Municipal Gas System[A] | 6,900 | 577 | 3,162 | — | — | — | 130 | 25 |
| 231 | 231 | Dyersburg Municipal Gas System[A] | 6,863 | 1,340 | — | — | — | — | 195 | 65 |
| — | 232 | Houston DPW, Gas Division[A] | 6,695 | 484 | 2,278 | — | — | — | 57 | 71[E] |
| — | 233 | Rio Grande Natural Gas Assoc. | 6,691 | 533 | 2,282 | — | — | — | 421 | 115 |
| 244 | 234 | Leesburg Natural Gas Department[A] | 6,600 | 831 | — | — | — | — | 118 | 62[E] |
| 277 | 235 | Petrolane Wyoming Gas Services[F] | 6,526 | 1,116 | N/A | N/A | N/A | N/A | 8 | 8 |
| 233 | 236 | Phenix (Ala.) Dept. of Public Util.[A] | 6,506 | 1,329 | 5,296 | — | — | — | 151 | 87 |
| 239 | 237 | Liberal Gas Co.[A] | 6,500 | 1 | 2,800 | — | — | — | 105 | 74[E] |
| 237 | 238 | Dixie Gas Co. Inc.[C] | 6,358 | 555 | 2,858 | 17 | 1,944 | 123 | 185 | 34[E] |
| 238 | 239 | Westfield Gas & Electric Light | 6,340 | 1,070 | 5,690 | N/A | N/A | N/A | 122 | 93 |
| 236 | 240 | Missouri Edison | 6,241 | 2,213 | 51,160[B] | 3,819 | 6,195 | 332 | 304 | 146 |

# The P&GJ 500 ... dimensions of the pipeline energy business

| Rank | | Name of Company | Number Of Customers | 1982 Gas Sales, MMcf | 1982 Oper. Revenues $(000) | 1982 Net Income $(000) | Gas Plant Value $(000) 12-31-82 | Additions To Plant $(000) | Miles of Mains | Mile of Services |
|---|---|---|---|---|---|---|---|---|---|---|
| 82 | 83 | | | | | | | | | |
| 242 | 241 | City of Wilson[C] | 6,123 | 952 | 4,855 | 796 | 2,503 | 166 | 117 | 61 |
| 240 | 242 | City of Fultondale Gas Board[A] | 6,039 | 583 | 2,815 | — | — | — | 145 | 57 |
| 249 | 243 | Concord Natural Gas Corp. | 6,026 | 1,184 | 7,147 | 205 | 3,670 | 613 | 151 | 80 |
| 247 | 244 | Shenandoah Gas Co. | 6,017 | 3,659 | 19,031 | 356 | 11,600 | 882 | 224 | 88 |
| 246 | 245 | Gas Utilities Co. (Ill.)[A] | 5,892 | 7,540 | 20,737 | — | — | — | 150 | 67[E] |
| 243 | 246 | Consumers Gas Utility Co.[A] | 5,881 | 974 | 4,345 | — | — | — | 266 | 62 |
| 251 | 247 | Watertown Gas Department | 5,733 | 1,234 | 5,113 | 609 | 1,904 | 155 | 117 | 106 |
| 248 | 248 | Cartersville Gas Department[A] | 5,720 | 2,250 | 1,856 | — | — | — | 163 | 54 |
| 250 | 249 | Bay City Gas Co.[A] | 5,620 | 852 | 900 | — | — | — | 105 | 53 |
| 253 | 250 | Consumers Gas Co.[A] | 5,598 | 1,165 | 3,657 | — | — | — | 88 | 102 |
| 254 | 251 | Cullman-Jefferson Counties Gas Dist.[A] | 5,573 | 1,680 | 7,400 | — | — | — | 60 | 350 |
| — | 252 | Morgan City Municipal Gas[A] | 5,536 | — | — | — | — | — | 79 | 53[E] |
| 255 | 253 | Sylacauga Utilities Board[A] | 5,531 | 1,390 | 5,432 | — | — | — | 472 | 575 |
| 256 | 254 | The Polaris Corp.[A] | 5,476 | 443 | 1,970 | — | — | — | 106 | 68 |
| 259 | 255 | Elizabethtown Natural Gas | 5,352 | 1,273 | 5,117 | 506 | 1,000 | 0 | 130 | 100 |
| 258 | 256 | The Toledo Edison Co. | 5,331 | 1,427 | 482[B] | 106 | 3,550 | 353 | 106 | 80 |
| 260 | 257 | City of Thibodaux[A] | 5,207 | 804 | 3,771 | — | — | — | 79 | 49 |
| 263 | 258 | City of Moss Point[A] | 5,200 | 352 | 479 | — | — | — | 95 | 48 |
| 264 | 259 | Bristol & Warren Gas Co.[I] | 5,168 | 4,117 | 4,190 | 149 | 1,767 | 132 | 75 | 44[E] |
| 262 | 260 | Pike Natural Gas Co. | 5,060 | 973 | 5,311 | 150 | 3,644 | 248 | 152 | 57[E] |
| — | 261 | City of St. Augustine Gas[A] | 5,012 | — | — | — | — | — | 51[E] | 57[E] |
| 269 | 262 | Decatur Utilities[C] | 4,936 | 5,689 | 23,507 | 529 | 7,030 | 419 | 166 | 87 |
| 267 | 263 | New Ulm Gas Dept.[A] | 4,916 | 1,744 | 5,278 | 156 | 1,752 | 39 | 72 | 44[E] |
| 265 | 264 | City of Milton | 4,896 | 3,286 | N/A | N/A | N/A | N/A | 154 | 56[E] |
| 257 | 265 | Northwest Alabama Gas District[A] | 4,875 | 8,771 | 18,496 | — | — | — | 276 | 203 |
| 268 | 266 | City of Chanute[A] | 4,833 | 763 | — | — | — | — | 84 | 46[E] |
| 270 | 267 | Fairhope Gas Department[A] | 4,781 | 482 | 1,156 | — | — | — | 85 | 54[E] |
| 271 | 268 | St. Joseph Light & Power[A] | 4,684 | 1,081 | 5,015 | — | — | — | 122 | 53 |
| 272 | 269 | Thomasville Water & Light[A] | 4,663 | 756 | 3,267 | — | — | — | 141 | 44[E] |
| 276 | 270 | City of Winfield[A] | 4,609 | 808 | 2,290 | — | — | — | 78 | 23 |
| 274 | 271 | Oak Ridge Utility District[A] | 4,601 | 788 | 3,156 | — | — | — | 140 | 66 |
| — | 272 | DeKalb-Cherokee Counties Gas[A] | 4,558 | 877 | 2,177 | — | — | — | 171 | 43[E] |
| — | 273 | City of Union[A] | 4,531 | 1,404 | 5,883 | — | — | — | 136 | 81 |
| — | 274 | Lexington Gas System (Tenn.)[A] | 4,516 | 1,917 | 2,857 | — | — | — | 67 | 43[E] |
| 275 | 275 | Lexington Gas Department (N.C.) | 4,512 | 2,389 | 8,380 | — | — | — | 13 | 77 |
| 278 | 276 | West Tenn. Public Util. District[A] | 4,415 | 1,830 | 4,896 | — | — | — | 314 | 130 |
| 279 | 277 | Clarksville Gas Department[A] | 4,379 | 2,826 | 6,755 | — | — | — | 212 | 41 |
| 280 | 278 | Westlake Municipal Natural Gas[A] | 4,376 | 293 | 1,234 | 193 | 905 | 42 | 84 | 45 |
| — | 279 | Ft. Pierce Gas Department[A] | 4,363 | 815 | 2,887 | — | — | — | 119 | 84 |
| 281 | 280 | Cody Gas | 4,310 | 2,181 | 8,696 | 576 | 5,050 | 495 | 304 | 51[E] |
| 283 | 281 | City of Shelby Gas Department | 4,277 | 3,032 | 12,433 | — | — | — | 111 | 81 |
| 284 | 282 | City of Dumas[A] | 4,200 | 448 | — | — | — | — | 38 | 40 |
| 282 | 283 | Indiana Natural Gas[A] | 4,173 | 873 | 3,237 | — | — | — | 107 | 39 |
| — | 284 | Frederick Gas Co. Inc.[A] | 4,166 | 2,616 | 10,888 | — | — | — | 81 | 55 |
| 288 | 285 | Chambersburg Gas Department[A] | 4,135 | 1,053 | 3,438 | — | — | — | 54 | 50 |

## The P&GJ 500 ... dimensions of the pipeline energy business

| Rank 82 | Rank 83 | Name of Company | Number Of Customers | 1982 Gas Sales, MMcf | 1982 Oper. Revenues $(000) | 1982 Net Income $(000) | Gas Plant Value $(000) 12-31-82 | Additions To Plant $(000) | Miles of Mains | Mile of Services |
|---|---|---|---|---|---|---|---|---|---|---|
| — | 286 | City of Toccao[A] | 4,101 | 711 | 2,974 | — | — | — | 100 | 39 |
| 285 | 287 | Bluefield Gas Co.[A] | 4,093 | 1,177 | 4,943 | — | — | — | 89 | 21 |
| — | 288 | Ville Platte Gas System[A] | 4,080 | 377 | 2,523 | — | — | — | 86 | 38 |
| 287 | 289 | Syracuse Suburban Gas Co. Inc.[F] | 4,063 | 3,626 | 234 | 157 | 3,915 | 275 | 81 | N/A |
| — | 290 | Nebraska City Utilities[A] | 4,057 | 792 | 3,117 | — | — | — | 41[E] | 46[E] |
| 290 | 291 | Deming Gas System[A] | 4,011 | 497 | — | — | — | — | 68 | 38[E] |
| 291 | 292 | Lawrenceburg Gas Co.[A] | 3,982 | 2,904 | 8,724 | — | — | — | 111 | 14 |
| — | 293 | Palatka Gas Authority[A] | 3,980 | 238 | 1,233 | — | — | — | 83 | 56 |
| — | 294 | City of Summerville[A] | 3,931 | 558 | — | — | — | — | 201 | 87 |
| — | 295 | Natural Gas Distributing[M] | 3,911 | 2,237 | 2,444 | 27 | 564 | 0 | 92 | 14 |
| — | 296 | Robstown Utility System | 3,904 | 283 | 1,669 | (38) | 221 | 6 | 54 | 16 |
| — | 297 | Elk River Public Utility District[A] | 3,895 | — | 6,143 | — | — | — | 199 | 37[E] |
| 292 | 298 | Los Alamos County Utilities | 3,795 | 744 | 2,634 | 0 | 2,993 | 448 | 63 | 37 |
| — | 299 | Town Gas of Illinois | 3,718 | 595 | 2,878 | 84 | 2,078 | 61 | 79 | 51 |
| 289 | 300 | Corinth Gas & Water Department | 3,564 | 544 | 2,275 | 18 | 1,107 | 104 | 78 | 41[E] |

# The 100 Leading Gas Pipelines

*(Including Gas Transmission Lines; Gathering Systems; Interstate and Intrastate)*

| Rank 82 | Rank 83 | Name of Company | Miles Of Pipelines Total | Transmission | Field. Gath. | Storage | 1982 Gas Sales, MMcf | 1982 Oper. Revenues $(000) | 1982 Net Income $(000) | Gas Plant Value $(000) 12-31-82 | Additions to plant 1982 $(000) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1 | Northern Natural Gas Co. | 23,238 | 14,570 | 8,462 | 206 | 652,218 | 2,436,213 | 85,250 | 2,142,352 | 143,659 |
| 2 | 2 | El Paso Natural Gas Co. | 21,598 | 9,331 | 12,249 | 18 | 1,018,510 | 4,054,407 | 48,631 | 2,861,464 | 163,772 |
| 3 | 3 | Columbia Gas Transmission Corp. | 18,254 | 10,190 | 6,834 | 1,230 | 932,768 | 3,856,735 | 61,470 | 1,966,375 | 216,271 |
| 4 | 4 | Tennessee Gas Pipeline Co. | 13,965 | 13,931 | 31 | 2 | 1,034,546 | 3,947,222 | 183,969 | 2,992,372 | 193,495 |
| 5 | 5 | K N Energy, Inc. | 13,137 | 10,274 | 2,842 | 21 | 121,740 | 434,701 | 26,452 | 520,988 | 37,431 |
| 6 | 6 | Natural Gas Pipeline Co. of America[F] | 12,671 | 10,764 | 1,811 | 96 | 1,030,673 | 2,938,324 | 111,216 | 2,189,580 | 127,557 |
| 7 | 7 | Panhandle Eastern Pipe Line Co. | 12,538 | 6,816 | 5,613 | 109 | 610,039 | 2,045,032 | 145,325 | 1,430,751 | 107,744 |
| 9 | 8 | Michigan-Wisconsin Pipe Line Co. | 11,386 | 7,700 | 3,493 | 193 | 548,419 | 2,455,009 | 164,093 | 2,284,323 | 255,161 |
| 8 | 9 | Lone Star Gas Co. (Enserch) | 10,767 | 8,429 | 2,267 | 71 | 495,015 | 2,151,374 | 34,972 | 840,121 | 63,026 |
| 11 | 10 | Transcontinental Gas Pipe Line Corp. | 10,142 | 9,875 | 146 | 121 | 936,267 | 3,652,623 | 130,842 | 2,547,234 | 278,720 |
| 14 | 11 | United Gas Pipe Line | 9,800 | 7,680 | 2,120 | — | 1,029,592 | 3,436,000 | 153,000 | 1,072,492 | 117,000 |
| 12 | 12 | Northwest Central Pipeline | 9,748 | 5,835 | 3,733 | 180 | 287,787 | 1,043,039 | 43,404 | 566,839 | 15,256 |
| 13 | 13 | Texas Eastern Transmission Corp. | 9,709 | 9,463 | 48 | 198 | 884,664 | 3,146,927 | 230,274 | 2,246,071 | 180,238 |
| 15 | 14 | Arkla, Inc. | 9,194[A] | 6,136 | 3,015 | 43 | 299,326 | 1,075,509 | 95,380 | 1,057,864 | 89,659 |
| 16 | 15 | Consolidated Gas Supply Corp. | 8,313 | 3,599 | 4,195 | 519 | 594,544 | 2,402,931 | 66,577 | 1,056,580 | 80,962 |
| 17 | 16 | Southern Natural Gas Co. | 7,681 | 7,493 | 140 | 48 | 526,029 | 1,987,250 | 96,203 | 1,086,749 | 114,599 |
| — | 17 | Texas Oil & Gas Corp.[I] | 7,562 | 989 | 6,573 | — | 389,342 | 1,878,557 | 247,098 | 1,941,735 | 150,361 |
| 18 | 18 | Northwest Pipeline Corp. | 6,628 | 3,467 | 3,154 | 7 | 282,000 | 1,601,832 | 152,963 | 1,293,839 | 97,000 |
| 19 | 19 | Colorado Interstate Gas Co. | 6,155 | 2,725 | 3,195 | 235 | 321,567 | 1,149,576 | 81,840 | 655,208 | 39,752 |
| 20 | 20 | Texas Gas Transmission Corp. | 5,891 | 5,613 | 61 | 217 | 620,676 | 2,097,931 | 113,463 | 825,749 | 65,031 |
| 21 | 21 | Valero Transmission Co. | 5,293 | 4,034 | 1,259 | — | 405,687 | 1,710,124 | 46,450 | 461,639 | 50,099 |
| 23 | 22 | Pacific Gas & Electric Co. | 4,833 | 3,849 | 932 | 52 | 683,682 | 3,607,424 | 192,289 | 1,986,989 | 82,561 |
| 24 | 23 | ONEOK, Inc[I] | 4,751 | 4,751 | — | — | 312,978 | 127,700 | 56,094 | 712,658 | 67,300 |
| — | 24 | Peoples Natural Gas (Div. Internorth) | 4,683 | 4,003 | 680 | — | N/A | N/A | N/A | N/A | N/A |
| 31 | 25 | Trunkline Gas Co. | 4,482 | 3,934 | 523 | 25 | 516,368 | 1,802,219 | 46,730 | 946,479 | 21,704 |

*A 1981 Data F FY ended 9-30-82 I FY ended 8-31-82 V Includes Michigan Gas Storage Co. W Began Operations in late 1982*

# The P&GJ 500 ... dimensions of the pipeline energy business

| Rank 82 | Rank 83 | Name of Company | Miles Of Pipelines Total | Miles Of Pipelines Transmission | Miles Of Pipelines Field, Gath. | Miles Of Pipelines Storage | 1982 Gas Sales, MMcf | 1982 Oper. Revenues $(000) | 1982 Net Income $(000) | Gas Plant Value $(000) 12-31-82 | Additions to plant 1982 $(000) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 25 | 26 | **Florida Gas Transmission Co.** | 4,314 | 4,314 | — | — | 189,216 | 678,345 | 40,456 | 460,406 | 6,862 |
| 29 | 27 | **Transwestern Pipeline Co.** | 4,309 | 4,309 | — | — | 290,425 | 1,150,629 | 36,421 | 618,022 | 89,901 |
| 26 | 28 | **Houston Natural Gas Corp.** | 4,235 | 1,200 | 3,000 | 35 | 1,025,051 | 2,347,461 | 227,936 | N/A | N/A |
| 10 | 29 | **Pioneer Corp. (Westar Trans. Div.)** | 4,218 | 3,511 | 707 | — | 192,805 | 626,417 | N/A | 54,972 | 12,325 |
| 27 | 30 | **Columbia Gulf Transmission Corp.** | 4,174 | 2,543 | 1,631 | — | 635,533 | 212,000 | 49,000 | 1,016,349 | 47,099 |
| 28 | 31 | Montana-Dakota Utilities Co. | 4,127 | 3,128 | 948 | 50 | 63,000 | 253,183 | 10,073 | 268,397 | 28,897 |
| 22 | 32 | National Fuel Gas Supply Corp. | 3,568 | 1,464 | 1,665 | 439 | 194,900 | 732,674 | 16,294 | 201,720 | 19,192 |
| 41 | 33 | Western Gas Pipeline Co. | 3,403 | 1,625 | 1,764 | 14 | 84,093 | 338,952 | 4,708 | 72,839 | 8,626 |
| — | 34 | Mustang Fuel Co. | 3,212 | — | — | — | N/A | N/A | N/A | N/A | N/A |
| 32 | 35 | Mitchell Energy & Development Corp. | 3,052 | — | — | — | 92,[illegible]66 | 961,713 | 80,303 | 120,572 | 20,858 |
| 33 | 36 | **Montana Power Co.** | 2,820 | 1,772 | 994 | 54 | 33,727 | 362,796 | 70,586 | 272,772 | 12,709 |
| 34 | 37 | **North Carolina Natural Gas Corp.** | 2,589 | 853 | 1,736 | — | 44,087 | 183,829 | 3,878 | 87,452 | 7,482 |
| — | 38 | **East Ohio Gas Co.** | 2,463 | 1,270 | 1,193 | — | N/A | N/A | N/A | N/A | N/A |
| 36 | 39 | **Michigan Consolidated Gas Co.** | 2,348 | 2,186 | 52 | 110 | 338,561 | 1,657,006 | 26,669 | 1,294,898 | 54,697 |
| 35 | 40 | **Peoples Natural Gas Co. (Pa.)** | 2,335 | 1,048 | 1,249 | 38 | N/A | N/A | N/A | N/A | N/A |
| 37 | 41 | Mississippi River Transmission Co. | 2,214 | 1,969 | 170 | 75 | 170,599 | 702,030 | 31,030 | 332,233 | 24,342 |
| — | 42 | United Texas Transmission Corp. | 2,204 | 1,885 | 319 | — | 507,584 | 1,897,023 | 118,111 | 562,958 | 85,592 |
| 38 | 43 | Equitable Gas Co. | 2,092 | 476 | 1,489 | 127 | 75,673 | 342,598 | 33,648 | 426,979 | 29,824 |
| 39 | 44 | Kentucky-West Virginia Gas Co.[A] | 2,044 | 27 | 2,016 | — | 27,390 | 53,420 | 24,469 | 142,244 | 4,400 |
| 42 | 45 | Transok Pipe Line Co. | 2,031 | 792 | 1,239 | — | 152,926 | 148,659 | 16,986 | 157,584 | 34,679 |
| 40 | 46 | **Western Slope Gas Co.** | 2,030 | 1,563 | 447 | 20 | 48,719 | 732,334 | N/A | 377,891 | 55,922 |
| 43 | 47 | **Mountain Fuel Supply Co.** | 1,971 | 1,299 | 662 | 10 | 127,364 | 412,131 | 30,713 | 625,985 | 72,450 |
| 48 | 48 | **Consumers Power Co.[V]** | 1,959 | 1,679 | 173 | 107 | 287,545 | 1,222,227 | 83,257 | 1,335,566 | 38,111 |
| 44 | 49 | **Louisiana Intrastate Gas Corp.[A]** | 1,874 | 1,874 | — | — | 203,617 | 844,854 | 59,168 | 243,624 | 21,267 |
| 45 | 50 | **Southwest Gas Corp.** | 1,683 | 1,677 | 6 | — | 78,279 | 399,116 | 14,397 | 333,167 | 27,628 |
| 51 | 51 | South Carolina Gas & Electric Co. | 1,653 | 1,653 | — | — | 116,481 | 47,759 | N/A | 64,341 | 36,148 |
| 46 | 52 | National Fuel Gas Distr. Corp. | 1,411 | 1,072 | 339 | — | 191,712 | 920,529 | 18,197 | 460,282 | 29,589 |
| 47 | 53 | Central Illinois Public Service | 1,372 | 1,351 | 9 | 12 | 33,255 | 587,083 | 66,344 | 126,994 | 6,830 |
| 49 | 54 | Great Lakes Gas Transmission Co. | 1,305 | 1,305 | — | — | 65,345 | 536,438 | 25,061 | 511,470 | 45,300 |
| 50 | 55 | Carnegie Natural Gas Co. | 1,170 | 257 | 913 | — | 22,909 | 89,032 | 3,180 | 75,612 | 8,434 |
| — | 56 | **Clajon Gas Co.** | 1,130 | 30 | 1,100 | — | N/A | N/A | N/A | N/A | N/A |
| 68 | 57 | **Northern Utilities Inc.** | 1,028 | 1,005 | 23 | — | 17,810 | 82,798 | 1,980 | 31,192 | (2,698) |
| 52 | 58 | **East Tennessee Natural Gas Co.** | 1,012 | 1,012 | — | — | 75,687 | 288,932 | 4,266 | 76,170 | 2,000 |
| 67 | 59 | **Tejas Gas Corp.** | 992 | 992 | — | — | 77,204 | 103,701 | 7,149 | 38,916 | 6,222 |
| — | 60 | **Pacific Lighting Gas Supply Co.** | 987 | 905 | — | 82 | 310,794 | 1,254,234 | 25,836 | 285,947 | 13,147 |
| 53 | 61 | Arkansas Oklahoma Gas Corp. | 983 | 571 | 409 | 3 | 11,969 | 34,299 | N/A | 39,209 | 4,077 |
| 54 | 62 | Arkansas Western Gas Co. | 966 | 697 | 269 | — | 18,232 | 58,384 | 20,074 | 44,153 | 6,499 |
| 56 | 63 | Algonquin Gas Transmission Co. | 930 | 930 | — | — | 158,710 | 742,587 | 18,690 | 212,294 | 33,734 |
| 55 | 64 | Midwestern Gas Transmission Co. | 915 | 903 | — | 12 | 228,501 | 908,400 | 1,274 | 162,532 | 1,808 |
| 57 | 65 | North Penn Gas Co. | 890 | 587 | 290 | 13 | 21,812 | 91,597 | 1,669 | 34,548 | 1,897 |
| — | 66 | **Northern Border Pipe Line Co.[W]** | 823 | 823 | — | — | N/A | N/A | N/A | N/A | N/A |
| 58 | 67 | **Mid Louisiana Gas Co.** | 816 | 398 | 418 | — | 26,805 | 109,359 | 11,859 | 69,086 | 8,378 |
| 59 | 68 | **Pacific Gas Transmission Co.** | 799 | 799 | — | — | 252,574 | 1,419,973 | 31,608 | 372,562 | 8,209 |
| 60 | 69 | **South Georgia Natural Gas Co.** | 769 | 769 | — | — | 28,788 | 116,968 | 5,833 | 20,435 | 1,630 |
| — | 70 | **Ferguson Crossing Pipe Line Co.** | 638 | — | 638 | — | N/A | N/A | N/A | N/A | N/A |

## The P&GJ 500 ... dimensions of the pipeline energy business

| Rank 82 | Rank 83 | Name of Company | Miles Of Pipelines Total | Transmission | Field. Gath. | Storage | 1982 Gas Sales, MMcf | 1982 Oper. Revenues $(000) | 1982 Net Income $(000) | Gas Plant Value $(000) 12-31-82 | Additions to plant 1982 $(000) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| — | 71 | Armadillo Gas Gathering Co. | 610 | — | 610 | — | N/A | N/A | N/A | N/A | N/A |
| 30 | 72 | Public Service Co. of N.C. Inc. | 607 | 607 | — | — | 41,863 | 211,793 | 7,000 | N/A | 3,016 |
| 77 | 73 | Northern Gas Co. | 607 | 555 | 38 | 14 | 9,009 | 45,421 | (1,113) | 17,689 | 2,762 |
| 62 | 74 | Associated Natural Gas Co | 602 | 602 | — | — | 11,516 | 52,068 | 790 | 21,560 | 1,199 |
| 63 | 75 | Valero Interstate Transmission Co. | 579 | 320 | 259 | — | 21,816 | 61,249 | 1,682 | 24,795 | 1,768 |
| 66 | 76 | Commonwealth Gas Pipeline Corp. | 559 | 559 | — | — | 69,443 | 279,227 | 3,254 | 49,048 | 9,124 |
| — | 77 | Perry Gas Co.'s | 555 | — | 555 | — | N/A | N/A | N/A | N/A | N/A |
| 64 | 78 | Channel Industries Gas Co. | 552 | 552 | — | — | 102,061 | 436,079 | 9,443 | 49,103 | 7,558 |
| — | 79 | Monterrey Pipeline Co. | 550 | 550 | — | — | N/A | N/A | N/A | N/A | N/A |
| 65 | 80 | Inland Gas Co. Inc. | 534 | 94 | 440 | — | 7,2[illegible]4 | 27,749 | (251) | 22,498 | 215 |
| 71 | 81 | Washington Gas Light Co. | 516 | 498 | 18 | — | 111.455 | 682,829 | 21,089 | 720,039 | 54,801 |
| — | 82 | Llano, Inc. | 509 | — | 509 | — | 25,500 | N/A | N/A | N/A | N/A |
| — | 83 | Southeast Alabama Gas Dist. | 470 | 470 | — | — | 7,230 | 30,055 | 1,287 | 25,883 | 541 |
| 70 | 84 | Sea Robin Pipeline Co. | 438 | 438 | — | — | 195,892 | 564,583 | 9,534 | 239,136 | 2,145 |
| — | 85 | Dow Pipeline Co. | 398 | 398 | — | — | N/A | N/A | N/A | N/A | N/A |
| — | 86 | Seagull Pipeline Corp. | 392 | — | 392 | — | 98,439 | 67,082 | 3,816 | 10,051 | 1,134 |
| — | 87 | MGTC, Inc. | 374 | 364 | 10 | — | 3,690 | 14,567 | 116 | 5,167 | 29 |
| 72 | 88 | Mountain Fuel Resources | 371 | 123 | 212 | 36 | 5,817 | 28,353 | 9,615 | 66,324 | 13,437 |
| 80 | 89 | Experanza Transmission Co. | 355 | 355 | — | — | 19,267 | 85,185 | 6,387 | 13,134 | 4,191 |
| 73 | 90 | Pacific Interstate Trans. Co. | 351 | — | — | — | 54,280 | 441,522 | 5,897 | 56,744 | 1,071 |
| — | 91 | Winnie Pipeline Co. | 333 | — | 333 | — | N/A | N/A | N/A | N/A | N/A |
| 74 | 92 | Stingray Pipeline Co. | 325 | 325 | — | — | N/A | 46,775 | 9,985 | 235,439 | 234,779 |
| 75 | 93 | Ala. - Tenn. Natural Gas Co. | 316 | 314 | 2 | — | 33,346 | 132,872 | 5,982 | 20,078 | 2,700 |
| — | 94 | Palo Duro Pipeline Co. | 315 | — | — | — | N/A | N/A | 3,400 | 14,600 | N/A |
| 6 | 95 | Louisville Gas & Electric Co. | 306 | 178 | — | 128 | 52,005 | 210,822 | 43,174 | 90,898 | 7,190 |
| 79 | 96 | Ringwood Gathering Co. | 302 | 26 | 276 | — | 10,584 | 21,619 | (160) | 10,881 | 573 |
| 78 | 97 | Western Gas Interstate Co. | 296 | 243 | 53 | — | 4,496 | 15,277 | 168 | 7,396 | 486 |
| — | 98 | Amoco Gas Co. | 279 | 247 | 32 | — | N/A | N/A | N/A | N/A | N/A |
| 84 | 99 | Valley Gas Transmission Inc. | 270 | — | 270 | — | 9,559 | 31,650 | 396 | 4,720 | 139 |
| 81 | 100 | Eastern Shore Natural Gas | 247 | 247 | — | — | 8,529 | 42,970 | 1,774 | 10,272 | 778 |

# The 100 Leading Liquid Pipelines

| Rank | | | Delivered out of system in 1982 Bbl (000) | | | 1982 Financial | | Property Value $(000) 12-31-82 | Changes in Prop. Val. $(000) | Miles of Lines Owned/Operated | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 82 | 83 | Name of Company | Crude oil | Products | Total | Oper Rev $(000) | Net Income $(000) | | | Gath. Lines | Crude Trunk | Products Trunk | Total |
| 1 | 1 | Arco Pipe Line Co.[D] | 523,685 | 138,687 | 662,372 | 873,120 | 268,035 | 2,416,955 | 19,090 | 1,800 | 2,673 | 3,775 | 8,248 |
| 2 | 2 | Colonial Pipeline Co. | — | 625,922 | 625,922 | 479,759 | 117,975 | 1,313,253 | 12,949 | — | — | 5,250 | 5,250 |
| 4 | 3 | Exxon Pipeline Co.[D] | 447,573 | 106,402 | 553,974 | 820,590 | 292,662 | 2,350,168 | 13,437 | 1,895 | 4,819 | 2,402 | 9,116 |
| 3 | 4 | Shell Pipe Line Co. | 378,487 | 148,844 | 527,331 | 148,030 | 36,209 | 418.486 | 964 | 2,000 | 4,657 | 411 | 7,068 |
| 7 | 5 | Gulf Pipeline Co. | 258,698 | 207,915 | 466,613 | 105,187 | 25,841 | 217.425 | 2,726 | 1,562 | 938 | 1,769 | 4,268 |
| 6 | 6 | Amoco Pipeline Co. | 304,879 | 121,021 | 425,900 | 174,507 | 56,487 | 484,783 | 17 | 2,333 | 7,808 | 2,049 | 12,190 |
| 9 | 7 | Lakehead Pipe Line Co. | 387,267 | — | 387,267 | 158,835 | 41,229 | 438,546 | (1,749) | — | 2,599 | — | 2,599 |
| 10 | 8 | Mobil Pipe Line Co.[D] | 253,457 | 93,896 | 347,354 | 153,121 | 54,948 | 291,254 | 12,536 | 4,362 | 5,150 | 2,297 | 11,809 |
| 11 | 9 | Sohio Pipe Line Co.[D] | 293,477 | 46,810 | 340,287 | 1,204,846 | 395,027 | 3,293,015 | 16,932 | 1,074 | 835 | 142 | 2051 |
| 8 | 10 | Texas Pipe Line Co. | 209,261 | 127,360 | 336,621 | 97,069 | 31,406 | 260,364 | 4,643 | 1,224 | 2,494 | 539 | 4,257 |

*A. Does not include undivided ownership interest in systems operated by other carriers.*

*B. Listed as CRA inc. in 1982*

*C. Listed as Trans-Oil in 1982 due to typographical error*

*D. Owns part of the Trans-Alaska Oil Pipeline*

# The P&GJ 500 ... dimensions of the pipeline energy business

| Rank 82 | Rank 83 | Name of Company | Delivered out of system in 1982 Bbl (000) Crude oil | Products | Total | 1982 Financial Oper Rev $(000) | Net Income $(000) | Property Value $(000) 12-31-82 | Changes in Prop. Val $(000) | Gath. Lines | Miles of Lines Owned/Operated Crude Trunk | Products Trunk | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 11 | 11 | **Buckeye Pipe Line Co.** | 13,359 | 256,704 | 270,063 | 101,858 | 18,677 | 343,875 | 4,195 | — | 130 | 3,340 | 3,470 |
| 12 | 12 | **Phillips Pipe Line Co.** | 91,199 | 176,894 | 268,093 | 124,073 | 21,952 | 333,816 | 10,996 | 1,107 | 1,978 | 3,570 | 6,655 |
| 5 | 13 | **Marathon Pipe Line Co.** | 132,528 | 101,299 | 233,827 | 113,887 | 41,697 | 330,718 | 2,271 | 1,063 | 1,697 | 1,379 | 4,139 |
| 14 | 14 | **Southern Pacific** | — | 230,450 | 230,450 | 72,250 | 25,112 | 92,980 | 7,846 | — | — | 2,511 | 2,511 |
| 17 | 15 | **Continental Pipe Line Co.** | 166,692 | 50,595 | 217,287 | 66,457 | 29,132 | 159,338 | 5,277 | 4,000 | 1,522 | 1,808 | 7,330 |
| 16 | 16 | Chevron Pipe Line Co. | 165,503 | 35,334 | 200,837 | 73,860 | 17,516 | 199,275 | 19,662 | 214 | 1,435 | 1,490 | 3,139 |
| 15 | 17 | Sun Pipe line Co. | 77,828 | 99,477 | 177,305 | 53,564 | 19,177 | 129,540 | 4,048 | 490 | 703 | 3,076 | 4,269 |
| 19 | 18 | Williams Pipe Line Co. | 5,305 | 164,072 | 170,007 | 140,946 | 35,404 | 454,586 | 17,183 | — | 82 | 8,025 | 8,107 |
| 18 | 19 | Cities Service Pipe Line Co. | 163,397 | 3,285 | 166,682 | 26,299 | 4,864 | 64,717 | 3,730 | 626 | 878 | 110 | 1,614 |
| 21 | 20 | Texas-New Mexico Pipeline Co. | 156,809 | — | 156,809 | 33,870 | 7,737 | 92,239 | 5,396 | 1,883 | 2,225 | — | 4,108 |
| 20 | 21 | **Plantation Pipe Line Co.** | — | 155,982 | 155,982 | 85,939 | 16,153 | 268,737 | 2,788 | — | — | 3,158 | 3,158 |
| 23 | 22 | **Texas Eastern Prod. Pipeline Co.** | 104 | 137,141 | 137,245 | 103,687 | N/A | 399,215 | 6,199 | — | — | 3,385 | 3,385 |
| 24 | 23 | **West Texas Pipe Line Co.** | 134,778 | — | 134,778 | 26,062 | 6,357 | 44,979 | 158 | — | 581 | — | 581 |
| 22 | 24 | **Mapco, Inc.** | — | 130,570 | 130,570 | 83,662 | 35,810 | 425,060 | 21,046 | — | — | 8,025 | 8,025 |
| 60 | 25 | **Mid-Valley Pipeline Co.** | 124,065 | — | 124,065 | 52,324 | 12,023 | 114,610 | 762 | — | 92 | — | 92 |
| 25 | 26 | Four Corners Pipe Line Co. | 93,447 | 17,428 | 110,905 | 47,520 | 8,150 | 131,249 | 32,468 | 284 | 1,202 | 24 | 1,510 |
| 30 | 27 | Explorer Pipeline Co. | — | 104,544 | 104,544 | 44,775 | 4,798 | 249,897 | 999 | — | — | 1,397 | 1,397 |
| 26 | 28 | Pure Transportation co. | 81,439 | 20,900 | 102,339 | 25,640 | 7,587 | 80,536 | 10,832 | 820 | 731 | 12 | 1,563 |
| 29 | 29 | BP Pipeline Inc. | 98,490 | — | 98,490 | 576,974 | 205,664 | 1,595,469 | 9,545 | — | 818 | — | 818 |
| 65 | 30 | Loop Inc. | 95,985 | — | 95,985 | N/A | (40,553) | 732,923 | 732,923 | — | 48 | — | 48 |
| 72 | 31 | **Locap Inc.** | 81,221 | — | 81,221 | 9,742 | — | 121,339 | — | — | 58 | — | 58 |
| 28 | 32 | **Ashland Pipe Line Co.** | 80,865 | — | 80,865 | 30,395 | 9,311 | 90,551 | 44 | 432 | 870 | — | 1,302 |
| 31 | 33 | **Wolverine Pipe Line Co.** | — | 76,482 | 76,482 | 21,850 | 4,835 | 71,141 | 407 | — | — | 620 | 620 |
| 33 | 34 | **Lake Charles Pipe Line Co.** | — | 71,226 | 71,226 | 3,843 | 656 | 10,367 | 38 | — | — | 13 | 13 |
| 32 | 35 | **Olympic Pipeline Co.** | — | 71,187 | 71,187 | 20,219 | 5,437 | 56,741 | 243 | — | — | 391 | 391 |
| 27 | 36 | Chicap Pipe Line Co. | 69,856 | — | 69,856 | 11,956 | 3,214 | 38,556 | 34 | — | 235 | — | 235 |
| 42 | 37 | Platte Pipe Line Co. | 62,486 | — | 62,486 | 33,076 | 10,965 | 71,485 | 1,229 | — | 1,280 | — | 1,280 |
| 41 | 38 | West Shore Pipe Line Co. | — | 60,509 | 60,509 | 13,505 | 2,921 | 32,676 | 167 | — | — | 322 | 322 |
| 36 | 39 | Owensboro-Ashland Co. | — | 60,004 | 60,004 | 9,308 | 1,791 | 43,514 | 26 | — | 295 | — | 295 |
| 40 | 40 | Badger Pipe Line Co. | — | 57,474 | 54,474 | 11,532 | 2,341 | 24,182 | 179 | — | — | 328 | 328 |
| 46 | 41 | **Minnesota Pipe Line Co.** | 56,196 | — | 56,196 | 16,220 | 2,509 | 28,875 | — | — | 365 | — | 365 |
| 58 | 42 | **Wesco Pipe Line Co.** | 55,332 | — | 55,332 | 16,866 | 674 | 65,991 | 4,946 | 704 | 681 | — | 1,385 |
| 34 | 43 | **Texaco-Cities Serv. Pipe Line Co.** | 52,972 | — | 52,972 | 6,481 | 2,066 | 52,987 | (13,122) | — | 276 | — | 276 |
| 38 | 44 | **Southcap Pipe Line Co.** | 50,257 | — | 50,257 | 14,927 | 2,726 | 53,372 | 27 | — | — | — | — |
| 37 | 45 | **Seaway Pipeline Inc.** | 48,163 | — | 48,163 | 12,085 | (14,559) | 209,003 | (4) | — | 515 | — | 515 |
| 45 | 46 | Amdel Pipeline Inc. | 32,275 | 9,646 | 44,921 | 7,520 | 5,721 | 27,293 | — | 10 | 529 | 28 | 567 |
| 51 | 47 | Shamrock Pipe Line Corp. | 27,572 | 16,264 | 43,790 | 16,449 | 5,058 | 22,666 | 3,929 | 635 | 316 | 544 | 1,495 |
| 48 | 48 | Kaneb Pipe Line Corp. | — | 42,041 | 42,041 | 26,495 | 7,480 | 89,014 | 23,527 | — | — | 1,671 | 1,671 |
| 35 | 49 | Portland Pipe Line Corp. | 41,196 | — | 41,196 | 16,975 | 3,387 | 53,121 | 44 | — | 510 | — | 510 |
| 39 | 50 | Texoma Pipe Line Co. | 38,595 | — | 38,595 | 15,019 | (4,819) | 157,945 | 853 | — | 504 | — | 504 |
| 43 | 51 | **Total Pipeline Corp.** | 26,591 | 11,693 | 38,284 | 6,830 | 470 | 23,429 | 469 | 231 | 436 | 64 | 731 |
| 52 | 52 | **Dome Pipeline Corp.** | — | 37,814 | 37,814 | 6,506 | 9,834 | 22,002 | 100 | 1 | 8 | 130 | 139 |
| 54 | 53 | **Collins Pipeline Co.** | — | 36,919 | 36,919 | 4,780 | 1,266 | 14,318 | — | — | — | 124 | 124 |
| 44 | 54 | **Santa Fe Pipe Line Co.** | — | 36,689 | 36,689 | 20,445 | 6,717 | 48,231 | 420 | — | — | 899 | 899 |
| 50 | 55 | **Hydrocarbon Trnsp. Inc.** | — | 35,402 | 35,402 | 39,515 | 9,579 | 130,040 | 2,598 | — | — | 1,510 | 1,510 |

# The P&GJ 500 ... dimensions of the pipeline energy business

| Rank |  |  | Delivered out of system in 1982 Bbl (000) |  |  | 1982 Financial |  | Property Value $(000) 12-31-82 | Changes in Prop Val $(000) | Miles of Lines Owned/Operated |  |  |  |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 82 | 83 | Name of Company | Crude oil | Products | Total | Oper Rev $(000) | Net Income $(000) |  |  | Gath Lines | Crude Trunk | Products Trunk | Total |
| 47 | 56 | Dixie Pipeline Co. | — | 34,008 | 34,008 | 29,993 | 6,109 | 71,856 | 52 | — | — | 1,303 | 1,303 |
| 57 | 57 | Butte Pipeline Co. | 33,058 | — | 33,058 | 9,227 | 2,239 | 17,708 | — | — | 373 | — | 373 |
| 59 | 58 | Laurel Pipe Line Co. | — | 32,634 | 32,634 | 13,397 | 2,472 | 57,432 | 1,512 | — | — | 453 | 453 |
| 62 | 59 | Jayhawk Pipeline Corp. | 31,314 | — | 31,314 | 6,329 | 1,036 | 21,065 | 139 | 233 | 513 | — | 746 |
| 49 | 60 | Osage Pipe Line Co. | 30,616 | — | 30,616 | 6,349 | 1,491 | 19,594 | 3 | — | 136 | — | 136 |
| 53 | 61 | Hess Pipeline Co. | 29,449 | — | 29,449 | 9,314 | 1,275 | 50,850 | 734 | 427 | — | — | 427 |
| 61 | 62 | Belle Fourche Pipeline Co. | 28,888 | — | 28,888 | 14,975 | 4,432 | 47,534 | 2,509 | 998 | 729 | — | 1,727 |
| 63 | 63 | Cochine Pipeline System | — | 26,656 | 26,565 | 72,380 | 44,401 | 240,754 | 155 | — | — | 1,200 | 1,200 |
| 69 | 64 | Getty Pipeline Inc. | 11,540 | 13,231 | 24,771 | 2,668 | 2,471 | 10,941 | 3,100 | — | 55 | 489 | 544 |
| 67 | 65 | Mobil Alaska Pipeline Co. | 24,074 | — | 24,074 | 152,021 | 62,518 | 394,120 | 1,713 | — | 818 | — | 818 |
| 76 | 66 | Portal Pipe Line Co. | 23,707 | — | 23,707 | 18,192 | 7,298 | 31,643 | — | 260 | 551 | — | 811 |
| 55 | 67 | Oiltanking of Texas Pipeline Co. | 22,317 | — | 22,317 | 1,862 | 815 | 11,300 | 40 | — | 19 | — | 19 |
| 68 | 68 | Calnev Pipe Line Co. | — | 21,715 | 21,715 | 12,103 | 7,540 | 33,810 | 4,470 | — |  | 566 | 566 |
| 82 | 69 | Paloma Pipe Line Co.[A] | 21,635 | — | 21,635 | 2,265 | 747 | 5,797 | — | — | 112 | — | 112 |
| 64 | 70 | Cook Inlet Pipe Line Co. | 20,611 | — | 20,611 | 18,493 | 3,529 | 42,344 | 34 | — | 55 | — | 55 |
| 73 | 71 | Yellowstone Pipeline Co. | — | 19,667 | 19,667 | 10,111 | 2,729 | 28,159 | 268 | — | — | 749 | 749 |
| 75 | 72 | Diamond Shamrock Corp. | — | 19,104 | 19,104 | 16,652 | 4,748 | 32,289 | 182 | — | — | 622 | 622 |
| 66 | 73 | Farmland Industries Inc.[B] | 19,066 | — | 19,066 | 2,402 | 738 | 10,509 | 163 | 654 | 242 | — | 896 |
| 77 | 74 | Kaw Pipe Line Co. | 18,457 | — | 18,457 | 4,921 | 821 | 11,843 | 106 | 1,399 | — | — | 1,399 |
| 56 | 75 | Tecumseh Pipe Line Co. | 18,155 | — | 18,155 | 1,550 | 179 | 15,274 | 26 | — | 206 | — | 206 |
| 71 | 76 | Chase Pipe Line Co. | — | 17,427 | 17,427 | 9,377 | 5,350 | 38,340 | — | — | — | 698 | 698 |
| 79 | 77 | Wyco Pipe Line Co. | — | 16,075 | 16,075 | 11,138 | 2,983 | 24,917 | 442 | — | — | 677 | 677 |
| — | 78 | Seminole Pipeline Co. | — | 15,930 | 15,930 | 10,538 | (1997) | 201,361 | 12,169 | — | — | 787 | 787 |
| 74 | 79 | Ohio River Pipe Line Co. | — | 14,651 | 14,651 | 4,254 | 1,637 | 21,677 | 24,630 | — | — | 400 | 400 |
| 70 | 80 | Kenai Pipe Line Co. | 14,340 | — | 14,340 | 3,275 | 777 | 12,358 | 87 | — | 23 | — | 23 |
| 78 | 81 | American Petrofina Pipe Line | 11,456 | 1,643 | 13,100 | 3,650 | 224 | 16,715 | — | 161 | 538 | 46 | 745 |
| 83 | 82 | Okie Pipe Line Co. | 7,805 | 4,883 | 12,687 | 5,816 | 1,893 | 14,424 | 474 | 498 | — | 409 | 907 |
| 87 | 83 | Allegheny Pipeline Co | — | 12,613 | 12,613 | 7,018 | (147) | 27,709 | 1,294 | — | — | 603 | 603 |
| 81 | 84 | Acorn Pipeline Co.[A] | 12,544 | — | 12,544 | 3,686 | 2,056 | 3,341 | 6 | N/A | N/A | N/A | N/A |
| 80 | 85 | Gulf Central Pipeline Co. | — | 12,426 | 12,426 | 23,520 | 6,659 | 121,222 | 246 | — | — | 1,912 | 1,912 |
| 86 | 86 | Pioneer Pipeline Co. | — | 12,402 | 12,402 | 4,812 | 1,377 | 12,327 | 508 | — | — | 301 | 301 |
| 85 | 87 | Western Oil Trans. Co. Inc. | 10,236 | — | 10,236 | 22,345 | 2,779 | 14,423 | 764 | N/A | N/A | N/A | N/A |
| — | 88 | Tesoro Alaska Pipe Line Co. | — | 10,010 | 10,010 | 6,887 | 2,414 | 22,333 | — | — | — | 70 | 70 |
| — | 89 | Chisholm Pipeline | — | 9,694 | 9,694 | 3,182 | (1,428) | 18,029 | 2,626 | — | — | 203 | 203 |
| 88 | 90 | Jet Line Inc. | — | 9,153 | 9,153 | 3,838 | 811 | 12,118 | 16 | — | — | 111 | 111 |
| — | 91 | Cenex Pipeline Co. | — | 9,353 | 9,353 | — | — | — | — | — | — | 423 | 423 |
| 84 | 92 | Kiantone Pipeline Corp. | 9,264 | — | 9,264 | 1,958 | 46 | 13,193 | 143 | — | 78 | — | 78 |
| 90 | 93 | Trans-Ohio Pipeline Co.[C] | — | 8,802 | 8,802 | 2,424 | (367) | 13,843 | 8 | — | — | 133 | 133 |
| 91 | 94 | Amerada Hess Pipeline Corp.[D] | 8,754 | — | 8,754 | 56,382 | 24,705 | 147,823 | 612 | — | 818 | - | 818 |
| — | 95 | Midland-Lea Pipeline Co. | 6,637 | 1,557 | 8,194 | 5,054 | (853) | 19,928 | (1,299) | — | 49 | 275 | 324 |
| 94 | 96 | Phillips Alaska Pipeline Co.[D] | 8,047 | — | 8,047 | 50,084 | 21,762 | 125,211 | 562 | — | 818 | — | 818 |
| 93 | 97 | Union Alaska Pipe Line Co.[D] | 7,917 | — | 7,917 | 48,082 | 18,333 | 124,921 | 551 | — | 818 | — | 818 |
| 92 | 98 | TransMountain Oil Pipe Line Corp. | 7,502 | — | 7,502 | 318 | (74) | 6,743 | — | — | 64 | — | 64 |
| 97 | 99 | Mobil Eugene Island Pipeline Co.[A] | 7,335 | — | 7,335 | 4,973 | 1,874 | 26,339 | 12,854 | (181) | — | — | (181) |
| 89 | 100 | Interstate Energy Co. | — | 6,949 | 6,949 | 10,049 | — | 55,184 | 44 | — | — | 94 | 94 |

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# PIPELINE & GAS JOURNAL

One Hundred Twenty Five Years
SERVING THE INDUSTRY SINCE 1859

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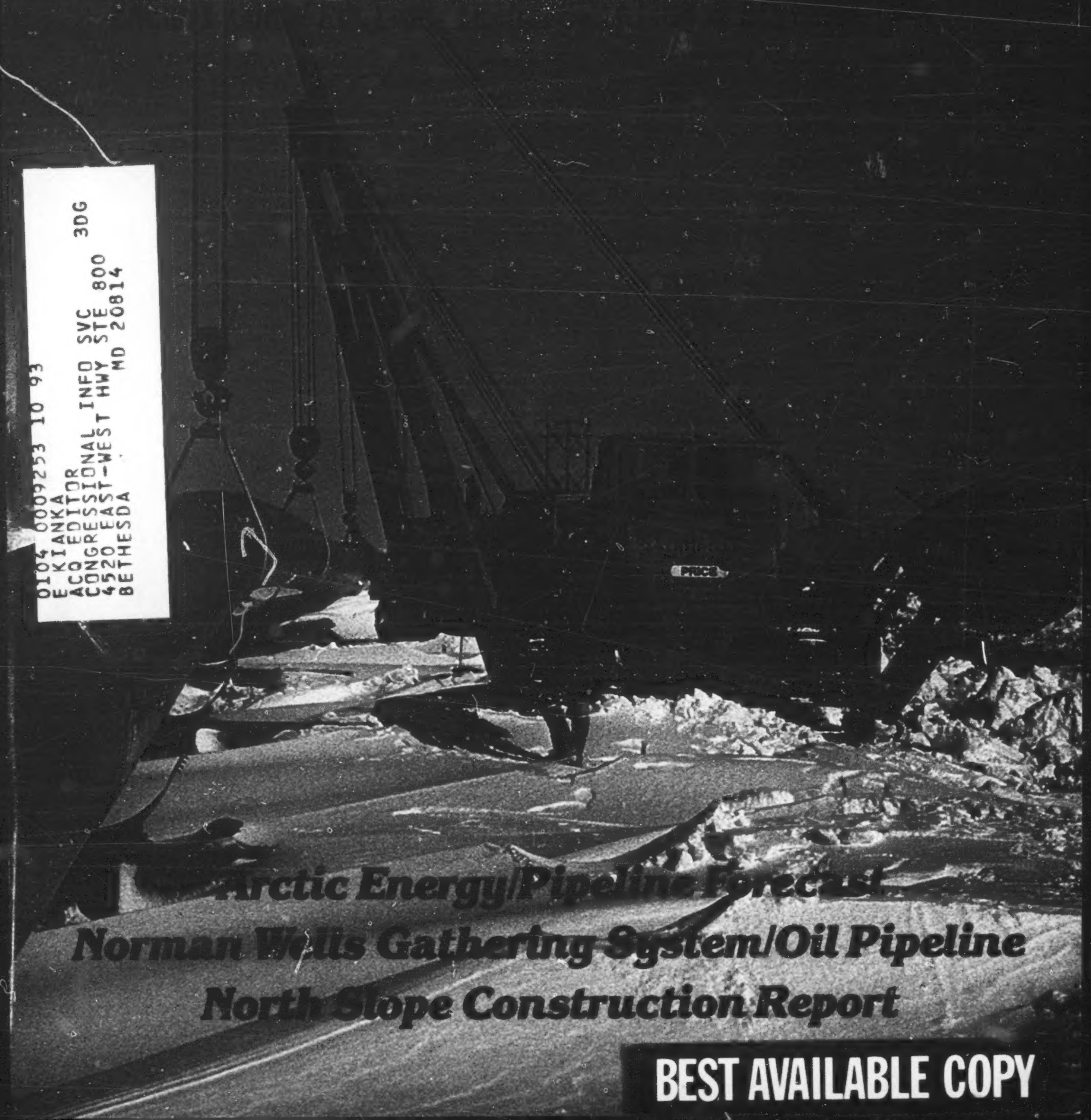

Arctic Energy/Pipeline Forecast
Norman Wells Gathering System/Oil Pipeline
North Slope Construction Report

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PIPELINE & GAS JOURNAL

*International Pipeline & Gas Utility Design, Construction & Operation*

*Published Continuously Since 1859*

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**COVER**

Pipeline activity on the North Slope of Alaska revolves around new waterflood pipelines, production flow lines, gas lift lines, and other insulated piping essential to extending the life of the Prudhoe Bay Field.

*—photo courtesy H.C. Price Construction Co.*

Contractors Numbers Decline But Equipment Ownership Stabilizing . . . . . . . . . . 18

Trend towards fewer contractors and smaller spreads is being countered by trend towards larger and more efficient machines, just one of the many revelations resulting from PIPELINE & GAS JOURNAL's first construction equipment survey since 1974.

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Months before work is to begin, contractors are mobilizing for the 537-mile 12-in. line from Norman Wells to Zama, Alta.

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Construction Equipment Specification Sheets: Air Compressors, Part 3 . . . . . . . . . . . . . . . . . . 53

What's New In Gas Distribution Equipment . . . . . . . . . . . . . . . . . . . . . . . . . . . 55

Best new ideas in getting gas from the city gate to the burner tip, from shovels to FM radios, are detailed.

# Arctic Prospects Strong; New Pipelines Depend On Market

**by Dean Hale,** *Editor*

Arctic energy continues to hold great promise for the future and both the U.S. and Canada see the region as an important source of oil and gas for the future. Oil from the North Slope—the 3-billionth barrel recently moved through the trans-Alaska oil pipeline—provides about 18% of U.S. production and about 11% of U.S. needs. Natural gas from the area abounds but is unable to reach the lower 48 market.

One of the reasons for the continuing optimism about the Arctic—an Exxon executive recently termed the Arctic "the future of the oil industry"—is that the oil and gas treasure estimated to be recoverable in this frigid, forebidding world is 30 to 55 billion bbl in Alaska and 20 to 25 billion in the Canadian Arctic. Gas reserves recoverable are estimated at 140 to 280 trillion cu ft in Alaska and 200 to 270 Tcf in the Canadian Arctic. (By contrast, in the Soviet Union's Arctic areas, 40 to 80 billion bbl of oil and 900 to 1100 Tcf of gas are estimated as recoverable).

The Arctic is a tough place to work, to explore, to build and operate pipelines. It is cold—temperature goes down to -60 F in deep winter and the wind blows hard—and it is dark—there are long periods of 24-hrs per day darkness.

Oil from the Arctic isn't—and won't be—cheap. Exploration, drilling, operating, and capital costs are estimated at $8 to $12 per bbl. Transportation costs of $4 to $12 per bbl to Canada or to the lower 48 mean that the basic cost, before royalties and taxes, ranges from $12 to $24 per bbl. Regardless, the price compares well with OPEC crude.

## Gas Pipeline Developments

It might be 10 years before Alaska will reap major benefits from gas reserves at Prudhoe Bay. The General Accounting Office's recent study of the situation for Congress said that lack of a guaranteed market is a major obstacle in completing the remaining 745 miles in Alaska and 2136 miles in Canada of the 4800-mile gas pipeline delivery system.

The Alaska Highway Gas Pipeline Project first received approval from Congress and then President Carter in 1977. The U.S. was then in the throes of a major natural gas shortage. In the six-year period since, cost of the project escalated from $10 billion to $40 billion and a hugh surplus of gas deliverability has developed in the lower 48 states. This surplus, accompanied by a price crisis, probably means a longer than anticipated delay in marketability of the Alaskan gas.

But, GAO added, the alternatives of exporting the gas as LNG to Japan, or converting it to methanol and other petrochemicals, or using it for electric generation and heating in Alaska, are also unattractive and uneconomical.

**Insulated pipelines** for gathering oil production, for waterflood injection water, for gaslift gas, and other requirements are integral part of Prudhoe Bay scene.

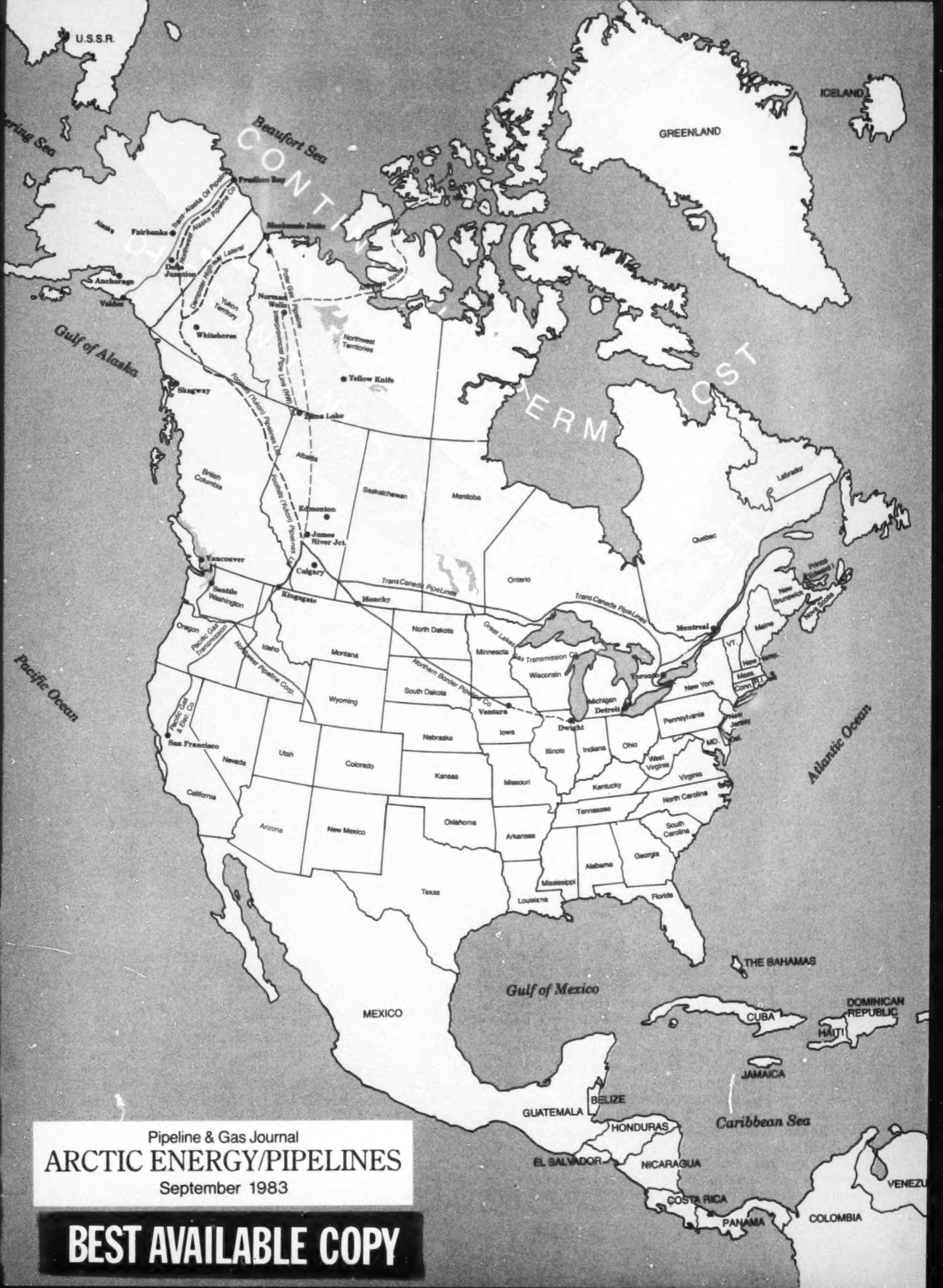
To the producers at Prudhoe Bay, the natural gas is "a nuisance." About 1.71 billion cu ft per day of gas is produced—and 1.54 Bcf is reinjected into the oil reservoir. Eventually the process will reach 3 Bcf reinjection per day. The North Slope producers are concerned about the cost of such reinjection.

The consortium of companies, led by Northwest Alaskan Pipeline Co., who have spent more than $700 million designing the gas pipeline system through Alaska and Canada to the east and west U.S. markets, are also concerned. In May 1982, the consortium announced it was deferring action for at least two years. The organization put together by Northwest Alaskan has been reduced to a skeleton force that continues to do limited research in Alaska and some engineering studies and design work (by Fluor) in Irvine, Calif., plus work on the conditioning plant by Ralph M. Parsons Co. in Pasadena, Calif.

When will work resume on the pipeline? It is still contingent on the economy, improved demand for natural gas, and price, says a spokesman for Northwest Alaskan. There is a general agreement that completion of the line will not occur before 1989.

Meanwhile, FERC has approved a rule that permits shippers of gas through the gas line to recover conditioning and transportation expenses automatically. Without such a rule, says FERC, shippers would have to make a general rate filing every time rates were adjusted to reflect pipeline charges. The rule also permits automatic passthrough of the costs as well as gas purchase costs to consumers. Tariffs authorized by the rule are an exception to general FERC policy.

Almost $1 billion can be saved in cost of the natural gas conditioning plant at Prudhoe Bay—nearly 25% of the cost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Beaufort Sea
Prudhoe Bay
Trans-Alaska Oil Pipeline
Northwest Alaska Pipeline Co.
Alaska
Fairbanks
Delta Junction
Anchorage
Valdez
Mackenzie Delta
Dempster Highway Lateral
Yukon Territory
Whitehorse
Norman Wells
Polar Gas Pipeline
Interprovincial Pipe Line (NW)
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Yellow Knife
Gulf of Alaska
Skagway
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Pipeline & Gas Journal

# ARCTIC ENERGY/PIPELINES

September 1983

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## Moving Arctic Energy To Market

Status of Projects and Proposals-September 1983

| Type | Name | Size and Miles | Location | Status |
|---|---|---|---|---|
| Oil | Trans-Alaska Oil Pipeline | 801 miles, 48-in. | Prudhoe Bay to Valdez | Completed and operating. |
| Oil | Interprovincial Pipe Line (NW) Ltd. | 540 miles, 12-in. | Norman Wells, N.W.T., to Northern Alberta | Under construction. |
| Oil | Imperial Oil Co., Ltd. | 500 miles 12 to 24-in. | Mackenzie Delta of Beaufort Sea to Norman Wells, NWT. | Proposed for 1990 operation. |
| Gas | ALASKA HIGHWAY GAS PIPELINE PROJECT | | | |
| | Northwest Alaskan Pipeline Co. | 745 miles, 48-in. | Prudhoe Bay to Alaska-Canada (Yukon) border | Final application for construction certificate made to FERC; delayed two years. |
| | Foothills Pipe Lines (South Yukon) Ltd. | 232 miles, 48-in.<br>276 miles, 56-in. | Southern Yukon | Expect Canadian federal approval when Alaskan section is approved. |
| | Foothills Pipe Lines (North B.C.) Ltd. | 444 miles, 56-in. | Northern British Columbia | Expect Canadian federal approval when Alaskan section is approved. |
| | Foothills Pipe Lines (Alberta) Ltd. | 394 miles, 56-in. | Alberta | Expect Canadian federal approval when Alaskan section is approved. |
| | Foothills Pipe Lines (Alberta) Ltd. | ● 187 miles, 36-in.<br>● 234 miles, 42-in. | Alberta | Prebuild section. Construction complete. |
| | Foothills Pipe Lines | ○ 105 miles, 36-in. | Southeastern B.C. | Approved. Construction complete on 55 miles. |
| | Foothills Pipe Lines (Saskatchewan) Ltd. | ● 161 miles, 42-in. | Saskatchewan | Completed. |
| | Northern Border Pipeline Co. | ● 823 miles, 42-in. | Monchy, Sask. to Ventura, Iowa | Completed. |
| | Pacific Gas Transmission Co. | ● 160.5 miles, 42-in. in four loops. | Idaho, Washington, Oregon | Construction completed. |
| | Pacific Gas Transmission Co. and Pacific Gas & Electric Co. | 721 miles, 42-in. | | Awaiting FERC approval. |
| | Northwest Pipeline Co. | ● 100 miles, 30-in.<br>● 251 miles, 24-in. | Oregon, Idaho | Loop on existing system; construction completed. |
| | Foothills Pipe Lines | 740 miles, 34-in. | Near Whitehorse to Mackenzie Delta area | Proposed; estimated cost $2.5 billion (as of June, 1979). |
| Gas | POLAR GAS PROJECT | 1300 miles, 36-in. | High Arctic Islands and Mackenzie Delta to southern Canada | Project plans to file new application with National Energy Board |
| Gas | CANADIAN WESTERN LNG PROJECT | | | |
| | Dome Petroleum, Ltd. | 375 miles, 24-in. | Compressor station No. 3 at McLeod Lake, B.C. on Westcoast Trans. Co. line to Grassy Point, Port Simpson Bay, B.C. | Needs NEB approval; will supply gas to LNG plant. |

*● Completed project ○ Partially completed project*

of the multi-billion-dollar facility. Actual savings, considering inflation and financing costs, will be much higher, said John G. McMillan, chairman and CEO of Northwest Alaskan. Adoption of a new process (the BASF activated MDEA process) will also result in significant savings in operating costs and reduced space requirements at Prudhoe Bay.

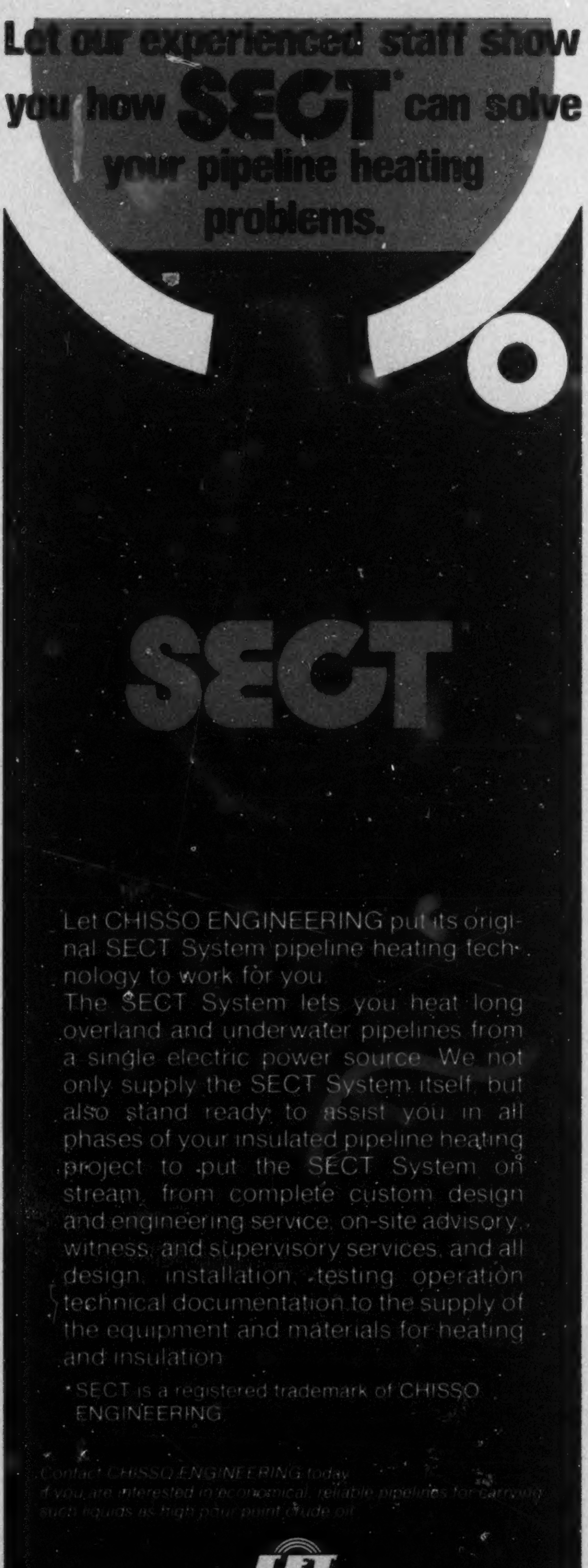
The Canadian government has given final approval to routing of the Alaskan Highway gas pipeline across the Yukon to British Columbia, lifting a five-year freeze on the proposed route. The Canadian Federal Northern Pipeline Agency plans to continue monitoring the delay in construction of the pipeline and retain its technical staff even though the line construction is deferred.

Foothills Pipe Lines (Yukon) Ltd., which will build and operate the Canadian section of the 48 and 56-in. line, is continuing design and planning for the 1352 miles that will be needed in Northern Alberta, British Columbia, and Yukon Territory. Phase II work will also include 234 miles of expansion to the Phase I (prebuild) facilities. The Dempster Lateral (740 miles) will take place later.

### Trans-Alaska Oil Pipeline

On July 21, 1983, at 9:26 a.m., after a 5-day, 10-hour trip from Prudhoe Bay, the three billionth barrel of crude oil arrived at the Valdez marine terminal. Currently, pipeline throughput is 1.6 million bbl per day, with 1.5 million bbl daily from Prudhoe Bay Field and 100,000 bbl daily from Kuaparuk Field. The first barrel of North Slope oil was shipped Aug. 1, 1977 from Valdez. Since then, over 3700 tankers have been loaded with North Slope oil at the terminal. Oil through the pipeline provides about 18% of total U.S. production and about 11% of domestic consumption.

Contract for management services on the pipeline has been awarded to Grandmet Ahtna, a joint venture, by Alyeska



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Pipeline Services Co., operator of the line. Grandmet Ahtna is a joint venture company formed by Grandmet International Services, Ltd. of London and Ahtna, a native Alaskan company owned by Athabascan Indian people. Contract covers catering, housekeeping and janitorial services at nine permanent and five seasonal pump stations on the line.

### North Slope Activities

Over 130,000 ton of cargo, most of it equipment for the Prudhoe Bay waterflood project, arrived at the North Slope by barge in late August. Included was a 600-ft long, 10-story high, 30,000-ton, barge-mounted sea water treatment plant built in Korea. The barge-plant will take water at the end of a 2½-mile causeway, heat the water to 40 F, filter it, deoxygenize it, and pump it through two insulated pipelines to onshore injection plants. The plant will handle up to 2 billion bbl of water per day.

The plant is the key to a $2 billion project to maintain production rates at 1.5 million bbl per day by Arco, Alaska, Inc. and Sohio Alaska Petroleum Co., operators of the Prudhoe Bay Field. Ultimate recovery is expected to be increased from 5.3 to 9.6 billion bbl.

Fluor Engineers Inc. has completed the first phase of work on the Sohio side of the field with water treatment and reinjection increased to 100,000 bbl per day at Gathering Center Two and 25,000 bbl at Gathering Center Three. Phase Two modules at GC 3 will increase injection there to 100,000 bbl per day. Phase Three modules will be installed at GC 1 and GC 2. Total project completion is set for mid-1984.

Sohio Construction Co. has awarded contract to Brown & Root to assist in construction management of new manifolding stations, waterflood systems, low pressure separation, piping interconnections, and modernizing of existing gathering stations. Work is to be completed by end of 1984.

Contract for construction of Kuaparuk Transportation Co.'s new pipeline from Kuparuk Field to Alyeska's Pump Station 1—27 miles of 24-in. plus 9 miles of 12 and 18-in. laterals—has been awarded to a joint venture of Arctic Slope Wright Schuchart/Gregory & Cook. The line, when completed and in operation in 1984, will replace a 16-in. line laid in 1981-82 (see P&GJ, September 1982, page 23).

### Other Developments

Sohio Construction Co. has awarded contract to Ralph M. Parsons Co. for engineering design services for facilities for the Endicott Reservoir in Alaska's Beaufort Sea. Endicott is near the Sag River Delta, about 20 miles northeast of Prudhoe Bay. It is expected to produce about 100,000 bbl per day when in operation. An oil pipeline to Alyeska's Pump Station 1 is anticipated eventually.

Arco Alaska Inc. has begun the first waterflood project on the North Slope by injecting 22,000 bbl of water per day into wells at sites A and E in Kuparuk Field. Injection rate will be increased gradually to 50,000 bbl per day. Project will allow recovery of another 800 to 900 million bbl of oil.

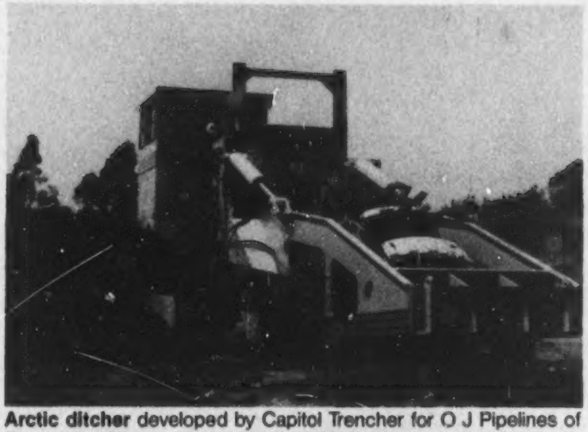
Sohio expects to find additional reserves in the Mukluk area of the Beaufort Sea northwest of Prudhoe Bay. A $67 million gravel island is to be built and a wildcat drilled in November, followed by a second well in January 1984. Sohio expects to find a field one-third to one-half the size of Prudhoe Bay Field.

A gravel island drill site is being built also for Gulf Oil Corp. and Tenneco Inc. for a wildcat well in Cross Island area of the Beaufort Sea, on the northern edge of the federal and state tract area.

Prudhoe Bay producers are happy with the Supreme Court's recent ruling on the windfall profit tax on crude oil that exempts North Slope production because it is a harsh, remote environment with exceptionally high costs.

### Polar Gas Project

After many years of research and evaluation of a great number of alternative approaches, has selected a multi-phase



**Arctic ditcher** developed by Capitol Trencher for O J Pipelines of Edmonton, Alberta for use in permafrost country is designed with special features for use in the Canadian Arctic. The 90-ton machine, equipped with a 750-hp Caterpillar diesel engine, can dig from 30 to 60-in. wide ditch at depth of 10-ft. Cold country features include hydraulic jacks and wheel to completely lift trencher off ground to allow tracks and hydraulic components to warm in cold starting conditions; supercharged hydraulic system with precharged pumps; cold resistant rubberized conveyor and pulley assemblies; special cold country seals in hydraulic rams, and a four-ton sliding counterweight to assist in raising the wheel out of ground. Unit is to get major test during 1983-84 winter construction season.

pipeline system as the most cost effective and practical means of connecting gas reserves in the Canadian Arctic to southern markets. First phase under new plan would be a gas line from the Mackenzie Delta to nearest point of interconnection with existing systems. Project would include about 1300 miles of 36-in gas pipeline.

Other phases would be extensions to additional Arctic production, plus possible looping of the system as delivery requirements expanded. Under the new plan, Polar Gas expects to begin work on its system by mid-1980's.

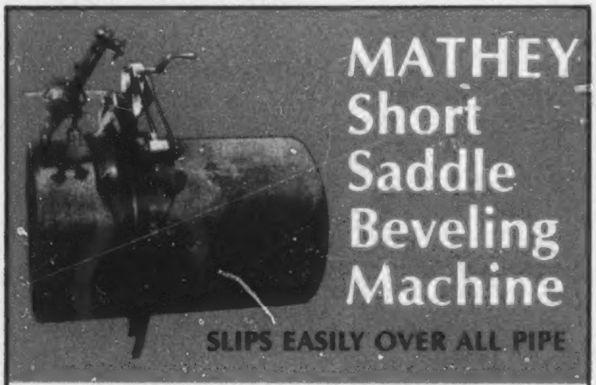
Beaufort Sea discoveries and ultimate production offshore Richards Island in the Mackenzie Delta are expected to require at least three interlinked subsea pipelines to handle oil, gas, and water between offshore production islands. If (and when) oil production becomes substantial, a 500-mile oil pipeline to Norman Wells from the Mackenzie Delta area would also be required. Prior to that time, tankers would carry production to markets. Imperial sees the pipeline being needed by 1990.

## Canadian Arctic LNG

Dome Petroleum's Canadian Western LNG Project, planned for a location south of Grassy Point on Port Simpson Bay, B.C., is being designed to liquefy 408 MMcf per day of natural gas for export to Japan. Plant was announced for operation in 1986 for a 20-year period. Gas for the facility would be delivered through a new 375-mile, 24-in. pipeline originating at compressor station No. 3, at McLeod Lake, B.C., on the Westcoast Transmission Co., Ltd. pipeline. Gas produced in Alberta and British Columbia would be transported to the LNG plant.

Arctic Pilot Project's $C2.5 billion project involving construction of a gas pipeline on Melville Island in the Canadian Arctic, a barge-mounted liquefaction plant, and transportation of the LNG by ice-breaking tankers to Europe is in abeyance. Major obstacle has been obtaining contracts from purported European buyers. The lack of market has left the project in both regulatory and financial limbo.

In Canada's High Arctic, the search continues for oil and gas. Panarctic Oils, Ltd. now has 18 Tcf of gas reserves in the region and some significant oil finds. Charles R. Hetherington, president of Panarctic and a 40-year veteran of searching for Arctic energy, believes there is much oil and possibly 90 to 100 Tcf of gas to be found. **P&GJ**



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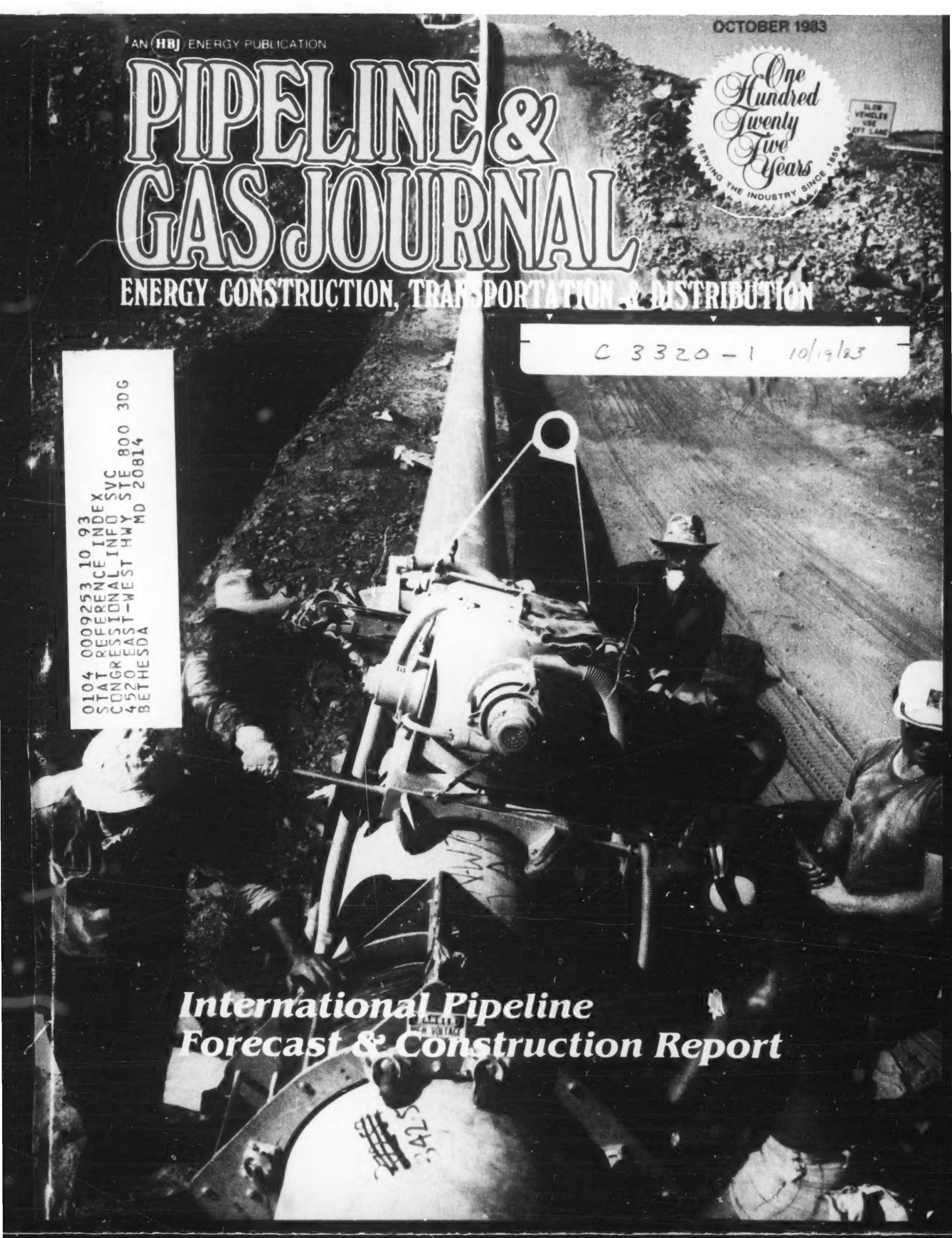
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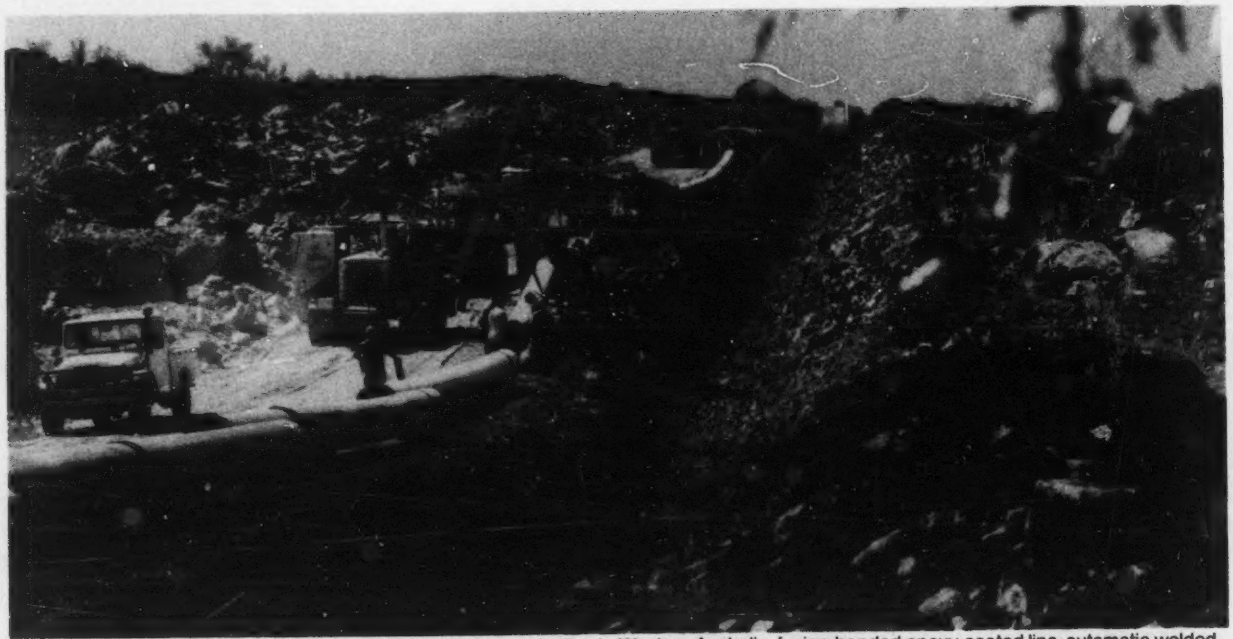
## International Pipeline Forecast & Construction Report

*International Pipeline Forecast*



**Pipe gang welds** together new 938-mile Dampier-Perth gas pipeline in Western Australia; fusion-bonded epoxy-coated line, automatic welded, threads its way from Northwest Shelf coast through rocky country of remote western coastal region to serve developing industrial areas near Perth and Waggerup.

# World's Planned, Underway Lines Total Over 109,000 Miles

by **Dean Hale**, *Editor*

Pipeline construction around the world (outside the United States) in 1984 will involve the installation of over 11,700 miles of natural gas, crude oil, refined products, natural gas liquids, and slurried solids pipelines, and require expenditures in excess of $7.3 billion.

Currently, there are 109,321 miles of pipelines planned or under construction over the globe. That includes 85,683 miles of planned or underway lines in the free world and 23,638 miles in the U.S.S.R., the eastern bloc countries, and China. Estimated cost of these lines, if built today, is $173.4 billion.

During 1983, an estimated 11,349 miles of pipelines will be installed around the world at a cost of over $6.5 billion. That's 16.5% fewer miles than in 1982, and the decline can be attributed to a slowdown in world economic conditions, a decrease in the demand for oil and gas all over the world, a continuing high cost for borrowed money, and inflationary pressures that have been reduced but not eliminated.

During 1984, according to results of *Pipeline & Gas Journal's* survey of world pipeline activity, the current construction activity rate will continue and most likely will show some increase.

The P&GJ Survey indicates that 1983 construction will include 7334 miles gas transmission mainlines, gathering lines, and field lines; 2070 miles crude trunk lines and crude gathering lines; 1523 miles of refined products and natural gas liquids/LPG lines; and 422 miles of offshore oil and gas lines.

Included in that total are many projects—a few large ones, many moderate-sized projects, and a lot of smaller undertakings. Included in the 1983 list are the first phases of the Norwegian Statpipe offshore gas system in the North Sea; the Dampier-Perth gas pipeline in western Australia; continuing construction of the Danish gas transmission pipeline system; extension of ENAGAS' gas system in Spain; construction of three major pipelines in Algeria; several major projects underway in Saudi Arabia; major pipeline construction in Pakistan and Bangladesh; and many other smaller but vital projects.

"Super projects" abound in pipeline planning; overall indications are that pipeline builders and planners and engineers will be busy to the end of the century.

Of the 98,282 miles of planned pipelines listed in the P&GJ survey, 64.4% are natural gas pipelines; 19.8% are crude oil pipelines; 9.8% are products and gas liquids pipelines; and 6.0% are slurried solids pipelines.

Analysis of the 11,039 miles of lines now under construction shows that 64.1% are natural gas lines; 20.1% are crude oil lines; 14.9% are products and gas liquids pipelines, and 0.9% are slurried solids lines.

**INTERNATIONAL PIPELINE CONSTRUCTION**

*(As of October 1, 1983)*

| Type of Line | Miles<br>Total | <br>Underway | <br>Planned |
|---|---|---|---|
| Natural Gas | 70,346 | 7,074 | 63,272 |
| Crude Oil | 21,663 | 2,217 | 19,466 |
| Refined Products | 11,220 | 1,648 | 9,572 |
| Slurry | 6,072 | 100 | 5,972 |
| **TOTALS** | **109,321** | **11,039** | **98,282** |

**Includes all free world (outside U.S.) plus Soviet Bloc and China*

## INTERNATIONAL PIPELINES PLANNED OR UNDER CONSTRUCTION

*(as of October 1, 1983)*

| | Gas Pipelines | | | Crude Oil Pipelines | | | Products Pipelines | | | Slurry Pipelines | | | TOTALS | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Area | Planned | Underway | Total | Planned | Underway | Total | Planned | Underway | Total | Planned | Underway | Total | Planned | Underway | Total |
| Canada | 13,301 | 268 | 13,569 | 823 | 587 | 1,410 | 593 | 92 | 685 | 500 | — | 500 | 15,217 | 947 | 16,164 |
| Mexico, Central America & South Am. | 10,840 | 422 | 11,262 | 3,428 | 68 | 3,496 | 2,007 | 315 | 2,322 | 243 | 100 | 343 | 16,518 | 905 | 17,423 |
| Europe & N. Sea | 14,820 | 1,209 | 16,029 | 738 | 32 | 770 | 627 | 107 | 734 | — | — | — | 16,185 | 1,348 | 17,533 |
| Africa & Middle East | 6,023 | 1,411 | 7,434 | 7,087 | 1,220 | 8,307 | 5,157 | 446 | 5,603 | — | — | — | 18,267 | 3,077 | 21,344 |
| Southeast Asia, Japan Pacific | 4,929 | 256 | 5,185 | 1,596 | 80 | 1,676 | 166 | 161 | 327 | 1,528 | — | 1,528 | 8,219 | 497 | 8,716 |
| Australia & New Zealand | 2,156 | 1,263 | 3,419 | 739 | 20 | 759 | 31 | 105 | 136 | 189 | — | 189 | 3,115 | 1,388 | 4,503 |
| **TOTALS** | 52,069 | 4,829 | 56,898 | 14,411 | 2,007 | 16,418 | 8,581 | 1,226 | 9,807 | 2,460 | 100 | 2,560 | 77,521 | 8,162 | 85,683 |
| Other (USSR, Eastern Bloc, China) | 11,203 | 2,245 | 13,448 | 5,055 | 210 | 5,265 | 991 | 422 | 1,413 | 3,512 | — | 2,912 | 20,761 | 2,877 | 23,638 |
| **WORLD TOTALS** (miles) | 63,272 | 7,074 | 70,346 | 19,466 | 2,217 | 21,683 | 9,572 | 1,648 | 11,220 | 5,972 | 100 | 6,072 | 98,282 | 11,039 | 109,321 |

Heading the list are Africa and the Middle East, with 21,344 miles total, of which 18,267 miles are planned; Europe and the North Sea ranks second, with 17,533 miles total, of which 16,185 miles are planned; in third spot is Mexico, Central America, and South America, with a total of 17,423 miles, of which 16,518 miles are planned; Canada follows in fourth place with 16,164 miles of total, of which 15,217 miles are planned; in fifth place is the Southeast Asia, Japan, Korea, and Pacific region, with a total of 8716 miles, of which 8219 are planned; Australia and New Zealand have a total of 4503 miles of pipelines, with 3115 miles planned.

Reported separately are the totals for the U.S.S.R., the eastern bloc countries, and China, with a total of 23,638 miles, of which 20,761 miles are planned.

## Europe and North Sea

Again in 1983, most of the activity in this region centered on the North Sea, where a number of subsea oil and gas lines were completed and the big Statpipe system, to deliver gas from the Statfjord and Heimdal fields to Ekofisk, was begun. Statpipe, in mid-September, was two weeks ahead of schedule. The *LB 200* laybarge, working on the northern section, averaged 1½ miles per day and had completed the first crossing of the Norwegian Trench at a depth of 935 ft. Operations were suspended in early September and will be resumed on March 15, 1984. On the southern section, the 36-in. line from Ekofisk to Heimdal, the *ETPM 1601* completed over 160 miles before shutting down for the winter.

Statoil has also announced plans for "Gullpipe," a 124-mile, 36-in. oil line to carry crude from Gullfaks Field to Bergen, Norway, at a cost of $700 million.

Statoil will also build the 40-mile, 20-in. oil line from Ula Field to Ekofisk for BP Petroleum Development Ltd., Norway, and other interests; line will cost in excess of $112 million.

Shell is finalizing plans for the 180-mile, 20-in. gas line from the Fulmar Field to St. Fergus, along with new gas treating facilities at St. Fergus terminal.

Dansk Ollie & Naturgas of Denmark completed installation of its 138-mile, 20-in. oil line and a companion 170-mile, 30-in. gas pipeline from the Gorm and Tyra fields to Kaergaard, and is completing work on a 45-mile, 30-in. line from Kaergaard to Egtved and a 68-mile, 20-in. oil line from Kaergaard to Frederica. Work is also underway on 68 miles of 30-in. gas pipeline from Store Baelt to Dragor, near Copenhagen. Work is underway, too, on segments of the 7800 miles of laterals and gas distribution lines for Komgas, the association of the five regional gas systems in Denmark responsible for "piping" that country and serving gas customers.

The Trans-Scandinavian Gas Pipeline Project, a joint undertaking by Sweden's Vattenfall power agency, Swedegas, and Statoil, continues to study all aspects of 1100-mile, $2.9 billion pipeline, ranging from 30 to 36-in. size, to link Northern Norwegian gas discoveries through Sweden to Western Europe.

Sydgas, Sweden's regional gas utility, continues planning for construction of the 65-mile, 24-in. link from Denmark to Malmo, and the 185-mile, 24-in. trunk gas line from Malmo to Halsted. Negotiations for import of gas from Denmark have been underway for months. If Sweden does not exercise its option to buy 6 billion m$^3$ for 17 years, Denmark will reportedly consider an offer from West German's Ruhrgas to buy up to 7 billion m$^3$ over 20 years.

The huge Troll Field, biggest offshore gas field in the world according to experts, (its 75 Tcf is three times as large as Prudhoe Bay) will need a pipeline outlet in a few years. The field is northeast of Frigg and southeast of Statfjord in Norwegian waters. Indications are that the gas will go to continental Europe.

Statoil is also beginning planning for a 70-mile gas liquids line to link Heimdal to Brae Feild by late 1985.

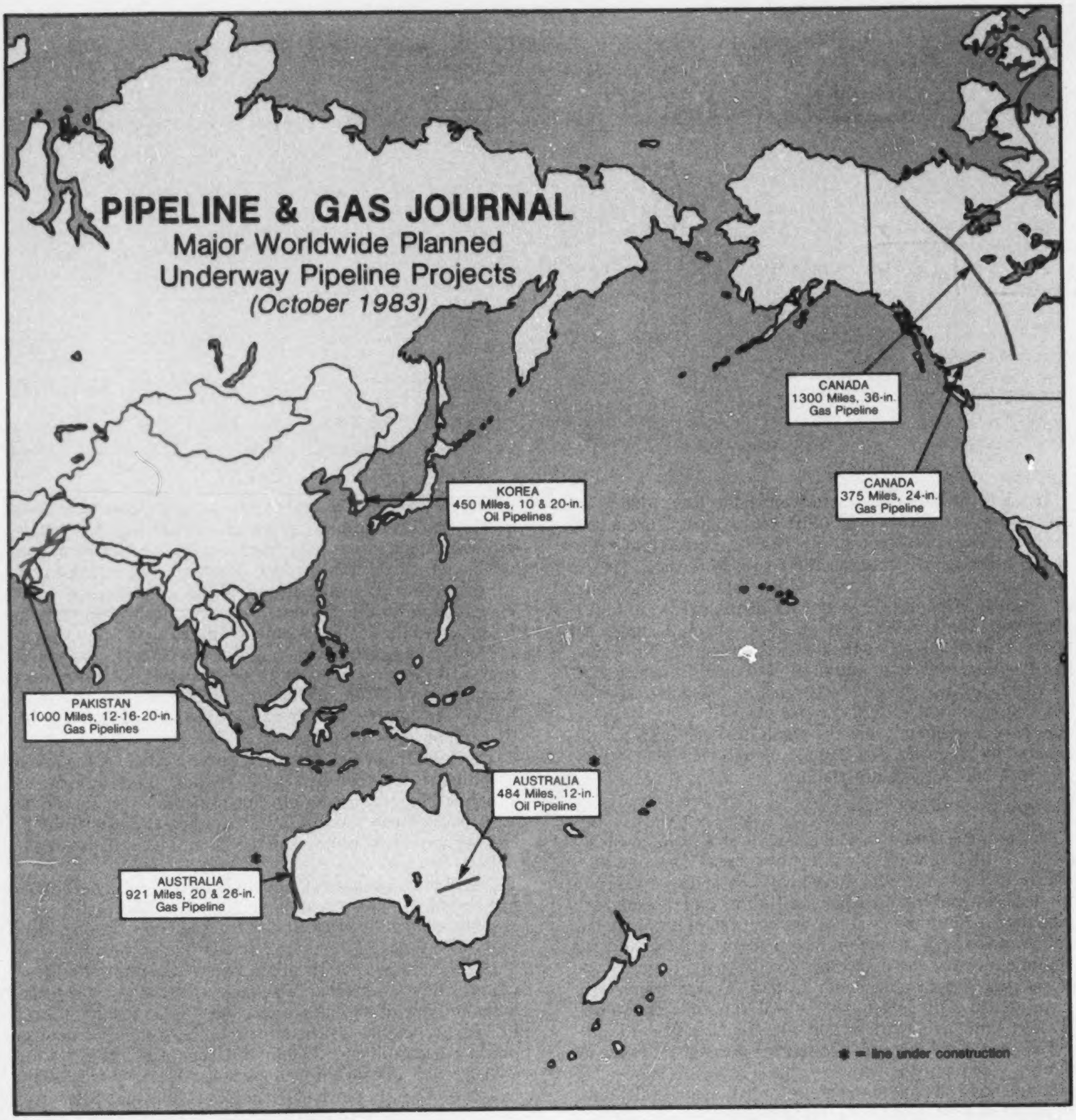
In the United Kingdom, British Gas has construction underway on 75 miles of 30 and 42-in. gas line in three projects. Shell's natural gas liquids line between St. Fergus and Moss moran will be completed this year—two sections, one of 56 miles and one of 44 miles—are underway on the 20-in. line. In Ireland, studies are underway on a 65-mile, 16-in. gas pipeline extension from Dublin to Ulster. Additional gas for Britain is now flowing through the $175 million, 49-mile, 20-in. Northern Leg gas pipeline between Magnus and Brent "A"

### 1983 International Pipeline Construction*

*(Estimated Miles Completed During Year)*

| | |
|---|---|
| Gas Transmission | 6212 |
| Gas Field, Gathering | 1122 |
| **TOTAL** | 7334 |
| Crude Trunk Lines | 1592 |
| Crude Gathering | 478 |
| **TOTAL** | 2070 |
| Products Lines | 1245 |
| NGL/LPG Lines | 278 |
| **TOTAL** | 1523 |
| Offshore Oil Lines | 104 |
| Offshore Gas Lines | 318 |
| **TOTAL** | 422 |
| **GRAND TOTAL** | 11,349 |

*Includes all free world (outside U.S.) plus Soviet Bloc and China*


PIPELINE & GAS JOURNAL
Major Worldwide Planned
Underway Pipeline Projects
(October 1983)
KOREA
450 Miles, 10 & 20-in.
Oil Pipelines
CANADA
1300 Miles, 36-in.
Gas Pipeline
CANADA
375 Miles, 24-in.
Gas Pipeline
PAKISTAN
1000 Miles, 12-16-20-in.
Gas Pipelines
AUSTRALIA
484 Miles, 12-in.
Oil Pipeline
AUSTRALIA
921 Miles, 20 & 26-in.
Gas Pipeline
* = line under construction

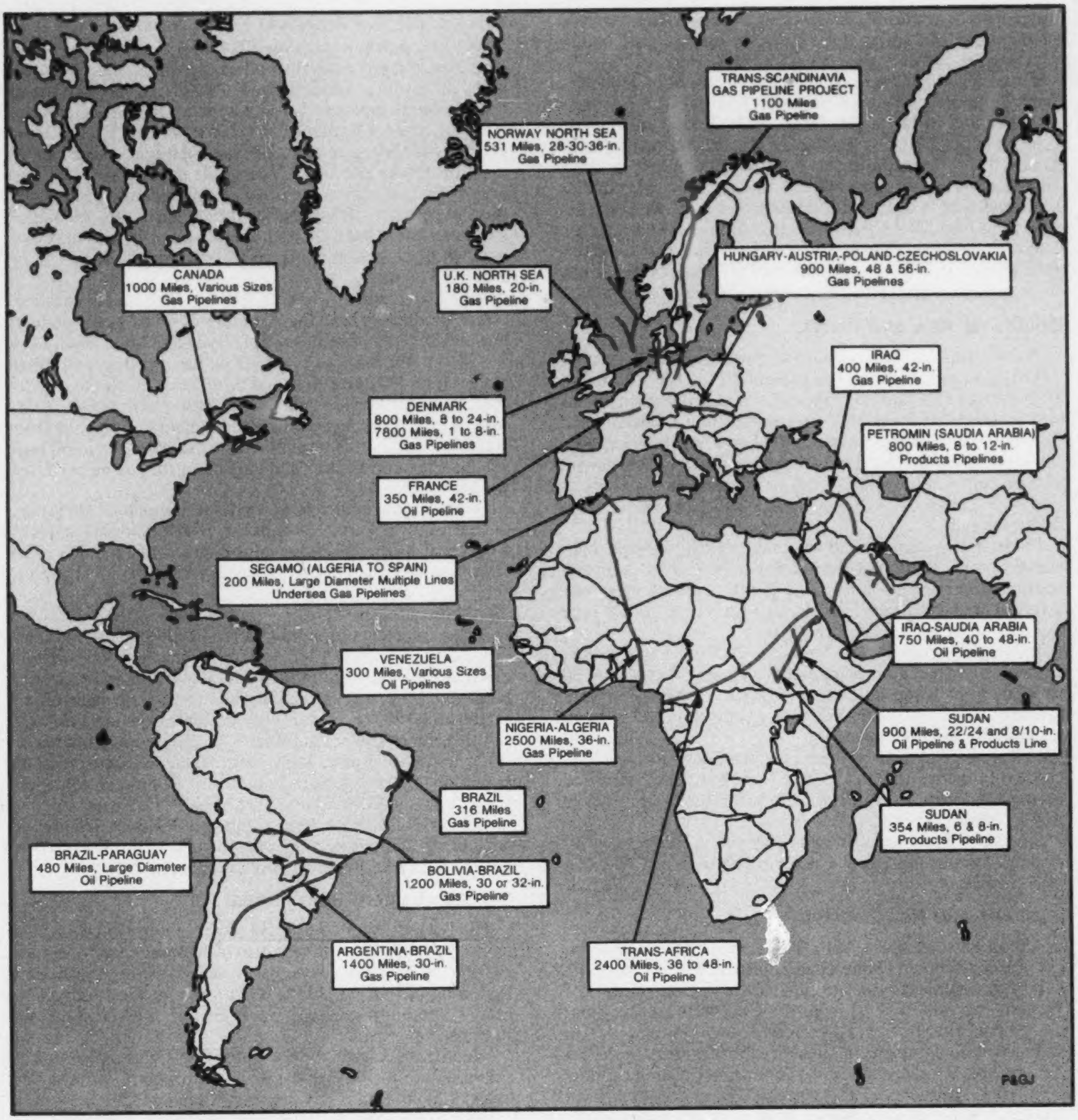
platform. Planning is also underway to bring gas ashore from the North Alwyn Field via a 68-mile, 24-in. line by 1987. Elsewhere, in the U.K. North Sea, the 57-mile Magnus-Ninian line went into operation in August.

On the continent, planning is underway on various projects, including 240 miles of 40 and 42-in. gas pipeline by OMV in Austria; 45 miles of 24-in. gas line is underway in France by Gaz de France; in Italy, 48 miles of 18-in. oil pipeline is being installed, and Italy's SNAM gas agency plans 185 miles of 10 and 20-in. gas pipeline for 1984 construction. Netherlands Gasunie plans to install 60 miles of gas pipeline, while offshore pipelines in the Netherlands include 124 miles of two-phase line being planned by NAM and Union; NAM also plans 46 miles of 24-in. offshore gas line and Mobil Netherlands plans 49 miles of 20-in. offshore gas line.

In Portugal, Petrosul is planning a 70-mile, 24-in. products line; in Spain, CAMPSA plans 89 miles of 10 to 14-in. products line from Huelva to El Arahal. Spain's ENAGAS has three major gas pipeline projects—53 miles of 20 and 26-in. from Zaragoza to Esquedas, 82 miles of 20-in. from El Serrablo gas field to Zaragoza, and 27 miles of 24-in. from El Orrio to Bilbao, now under construction. Catalana de Gas plans 271 miles of gas pipeline as part of the Spanish national gas grid to serve 150 small communities.

Pipeline activity on the continent has been materially affected by a decline in demand for petroleum products. Refinery utilization is down 7% to 62% of capacity and many refineries have been shut down, temporarily or permanently, mostly in Western Europe. Another major European concern is the development of a "unified" gas system to link and coordinate gas supplies; gas supply sources now include the North Sea, Algeria (both by pipeline and by LNG shipments), the U.S.S.R., and local production. The International Energy Agency has recommended that a "fail safe" system be developed.

Future developments are expected to give greater consideration to additional gas supplies from Africa by other underwater pipelines across the Mediterranean, such as the


TRANS-SCANDINAVIA
GAS PIPELINE PROJECT
1100 Miles
Gas Pipeline
NORWAY NORTH SEA
531 Miles, 28-30-36-in.
Gas Pipeline
HUNGARY-AUSTRIA-POLAND-CZECHOSLOVAKIA
900 Miles, 48 & 56-in.
Gas Pipelines
CANADA
1000 Miles, Various Sizes
Gas Pipelines
U.K. NORTH SEA
180 Miles, 20-in.
Gas Pipeline
IRAQ
400 Miles, 42-in.
Gas Pipeline
DENMARK
800 Miles, 8 to 24-in.
7800 Miles, 1 to 8-in.
Gas Pipelines
PETROMIN (SAUDIA ARABIA)
800 Miles, 8 to 12-in.
Products Pipelines
FRANCE
350 Miles, 42-in.
Oil Pipeline
SEGAMO (ALGERIA TO SPAIN)
200 Miles, Large Diameter Multiple Lines
Undersea Gas Pipelines
IRAQ-SAUDIA ARABIA
750 Miles, 40 to 48-in.
Oil Pipeline
VENEZUELA
300 Miles, Various Sizes
Oil Pipelines
SUDAN
900 Miles, 22/24 and 8/10-in.
Oil Pipeline & Products Line
NIGERIA-ALGERIA
2500 Miles, 36-in.
Gas Pipeline
BRAZIL
316 Miles
Gas Pipeline
SUDAN
354 Miles, 6 & 8-in.
Products Pipeline
BRAZIL-PARAGUAY
480 Miles, Large Diameter
Oil Pipeline
BOLIVIA-BRAZIL
1200 Miles, 30 or 32-in.
Gas Pipeline
ARGENTINA-BRAZIL
1400 Miles, 30-in.
Gas Pipeline
TRANS-AFRICA
2400 Miles, 36 to 48-in.
Oil Pipeline
P&GJ

SEGAMO project to bring gas from Algeria via a 200-mile undersea line (at depths to 2000 m or more) to Spain for delivery ultimately through Spain to France and other nations in the Common Market. Nigerian gas may also be delivered to Europe in this fashion through Morocco to Spain via lines across the Strait of Gibraltar.

## Middle East and Africa

Contracts are expected to be awarded by the end of 1983 for construction of the 1800 miles of crude oil and products pipelines in Sudan for White Nile Petroleum Co., a partnership of the Sudanese government, Chevron Oil Co. of Sudan, International Finance Corp., and Arab Petroleum Investment Corp. Project includes 900 miles of 22 and 24-in. crude oil line to move crude from the Unity and Heglig Fields to Port Sudan, and 900 miles of 8 and 10-in. line to move products in the reverse direction. Sudan is also the site for 354 miles of 6 and 8-in. products pipeline that will extend deliveries from Haiya to Gedaref to Kassala. Port Sudan would be the originating terminal for a 2200-mile, 36 to 48-in. crude oil line proposed by Trans-African Pipeline, Inc. that would terminate at Douala, Cameroons on the Atlantic Ocean. Such a line would greatly decrease transit time and cost for Middle East petroleum moving to Europe, North America, and South America.

Pipeline activity in Egypt continues at a good pace with 63 miles of 8 to 36 gathering lines planned, along with 200 miles of 24-in. gas line, for 1984; currently under construction are 61 miles of 16-in. gas line and 61 miles of parrallel 10 and 12-in. products line from Port Said to Abu Sultan.

Nigeria's big Escravos-Lagos gas project, involving 383 miles of 8 through 36-in. pipeline, is expected to get underway in late 1983 with contracts awarded on Phase I—83 miles of 8 to 30-in.

Algeria has 898 miles of pipelines under construction—264 miles of 48-in. and 315 miles of 42-in. gas line, plus 319 miles of 24-in. LPG line—and 465 miles planned, including 390 miles of 30-in. crude line. In Libya, work continues on 354 miles of 42-in. while in Tunisia, the state gas and electric agency in planning 248 miles of 8 and 10-in. natural gas liquids pipeline for 1984.

Financing is being arranged for a 280-mile, 24-in. crude line from Yumurtalik to Kirrikkale (near Ankara) with construction possible in late 1984. In Sharjah, a $300 million gas pipeline project is being planned to prevent flaring of gas. In Oman, 132 miles of 12-in. gas pipeline are planned for 1984. In Saudi Arabia, Aramco has 150 miles of 48-in. gas pipeline underway and is planning 650 miles of 4 through 42-in. gas gathering lines, 250 miles of 20 and 40-in. gas transmission line, and 408 miles of 32 and 34-in. oil pipeline, with construction to begin in 1984. Aramco also has 147 miles of 16 through 48-in. offshore lines underway at the Marjan offshore field.

## Southeast Asia and Pacific

Awards are expected for construction of Thailand's 27-mile, 24-in., $130 million, offshore gas line in the last quarter of 1983. India's first major offshore gas effort, now being planned, involved 146 miles of 36-in. from the South Bassein field to Umrat with and 11-mile lateral to Hagira. An 18 mile, 16-in. oil line from South Bassein field to Bombay Heights field will also be built. In Bangladesh, construction is nearing completion on 110 miles of 24-in. gas pipeline and 32 miles of 16 and 20-in. laterals.

Pakistan has been okayed for a major loan to install a national gas distribution grid involving some 430 miles of new transmission lines and connecting 75,000 new customers over a three-year period. Sui Gas has also completed its 215-mile Sui to Quetta gas line in Pakistan.

Indonesia reportedly is having a 2000-mile gas system studied, while Malaysia is planning 500 miles of gas lines, 30 to 36-in., from Trengganu field to Singapore; in Malaysia, work is also planned on 24 miles of 36-in. gas pipeline and 25 miles of 8-in. gas liquids line.

In Korea, planning continues on 450 miles of 10 and 20-in. crude oil pipeline while in Japan, work has been completed on the 35-mile products pipeline (aviation fuels) from Tokyo Bay to Narita Airport.

Slurry pipelines are also being planned in this region, including 619 miles in India, 450 miles in Thailand, and 188 miles in Australia.

## Australia and New Zealand

Almost one-half of the A$1.2 billion, 926-mile, 20 and 26-in. gas pipeline between Dampier and Perth in Western Australia has been completed for the State Energy Commission of Western Australia. The 80-mile, 40-in. offshore gas line from the Northwest Shelf was completed and "plowed in" in January. Also completed is the Alice Springs to Palm Valley gas pipeline, 93 miles of 6 and 8-in. line, permitting production to begin at the Palm Valley gas field in central Australia's Amadeus Basin. In Queensland, work is underway from both ends on the 484-mile, 12-in. Jackson to Moonie oil pipeline; the $125 million project will tie into an existing Moonie-Brisbane oil line.

Contract has been let by Esso Australia for four offshore pipelines, each 10 miles and 10-in., two of them gas, two of them oil, connecting the Tuna and Flounder platforms in the Bass Strait and the Snapper and Marlin platforms in the same area. An ethane pipeline, 150 miles of 6 to 8-in., has been proposed beween Stony Point and Gillman (near Port Adelaide) by the Japanese firm Asahi. New local gas pipelines include 83 miles of 12-in. from Wagga Wagga to Albury and 56 miles of 6 and 8-in. from Young to Orange, Bathhurst, and Lithgow.

In New Zealand, the 99-mile RAP products pipeline from Marsden Point to Auckland (Wiri) has been completed, as has a 30-mile, 6-in. LPG line from Oanui to Pt. Taranak. Construction is nearing completion on the 100-mile gas pipeline between Palmerston and Hastings. A 30-mile LPG line from Christchurch to Lyttleton Harbour now being planned will include nearly one mile of pipe in a tunnel under a bay.

## Mexico, Central America, South America

Mexico's pipeline plans for 1984 include 1925 miles of gas pipelines, and 685 miles of products pipelines. Currently, 101 miles of gas lines are underway. Costa Rico has two major trans-Isthmus pipelines being planned. One, by the government, involves 100 miles of 36-in. line between Puerto Moin and Puerto Mogos, to carry oil from west to east as a "shortcut" for Alaska and West Coast crude moving to Gulf Coast and eastern refineries; the other is a line planned for east to west movement of Venezuelan crude oil going to Japan. Panama, where the trans-Panamian oil line is now in operation, reportedly is studying an 80-mile methanol line along a parallel route.

Argentina reportedly has 200 miles of 30-in. under construction; Colombia is building 200 miles of 4 and 6-in. products line and 80 miles of 18-in. oil line; Bolivia plans to begin work in 1984 on 495 miles of 6 and 12-in. gas pipeline, and Brazil has 84 miles of gas pipeline and 62 miles of oil pipeline under construction. Brazil's "Nordestao" gas system on its northeastern coast, will involve a 254-mile main gas pipeline from Natal, in Rio Grande state, to Recife; 62 miles of lateral lines will also be built. Chile is studying plans for 563 miles of new gas lines.

Oil pipelines planned in South America include 1015 miles of new lines in Peru, 609 miles in Brazil, and 437 miles in Argentina. Major products lines planned include 538 miles in Bolivia, 625 miles in Colombia, and 454 miles in Argentina.

## Canada

Biggest pipeline project in Canada in 1984 will be construction on the 537-mile 12-in. oil line from Norman Wells to Zama, with work beginning in January 1984 and continuing until about April 1. Remaining line to be built will resume in January 1985. Line can only be built in winter months.

Other major Canadian projects on the planning boards include Dome's 375-mile, 24-in. from Westcoast Transmission's main line to Port Simpson Bay, British Columbia, to supply gas to a planned LNG plant; Polar Gas Project's revised plan to build 1300 miles of 36-in. from the Beaufort Sea area to Alberta, and Esso Resources' plan to build 1200 miles of 36-in. oil line from the Beaufort Sea to northern Alberta.

## U.S.S.R., Eastern Bloc, China

The Soviet Union completed construction—in one year—on its 2760-mile, 56-in. Urengoi to Uzhgorod, Czechoslovakia gas pipeline that will deliver gas to western Europe customers beginning January 1, 1984. While the pipeline is complete, testing continues as does work on the line's compressor stations.

In conjunction with the Soviet gas line, Czechoslovakia has embarked on a five-year construction program to build 537 miles of 56-in. transit gas line, and Poland will build 35 miles of 56-in. as the fourth transit gas pipeline to the Hungarian border.

Other Soviet pipeline activity includes a 1550-mile, 48-in. oil pipeline across the Urals from western Siberia to Perm, Gorki, Yaroslav and Moscow refinery sites, now under construction, along with the fourth 2480-mile, 56-in. Urengoi to western U.S.S.R. gas pipeline. Work is also underway on a 400-mile gas line on Sakhalin Island.

In China, work has begun on plans for two major coal slurry pipelines, each to carry 40 million tons per year. One project, 480 miles in length, will take coal from inner Mongolia to Qinhuangdau Port in Hebei province. The other, 600 miles long, will carry coal from Lu'an in Shanxi province to Nantong Port, Jiangsu province. China also has three 600-mile pipelines under construction—a gas line from Zhonyuan to Kaifeng fertilizer plant in Henan province; a gas line from Zhongyuan to Cangzhou fertilizer plant in Hebei province and Jilu chemical plant in Shandong province; and a 600-mile oil line from Zhongyuan to Henan oil refinery near Jiyuan.

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*Management Report*

# Gas Industry Executive Pay: Holding Companies Impact Big

by Dean Hale, *Editor*

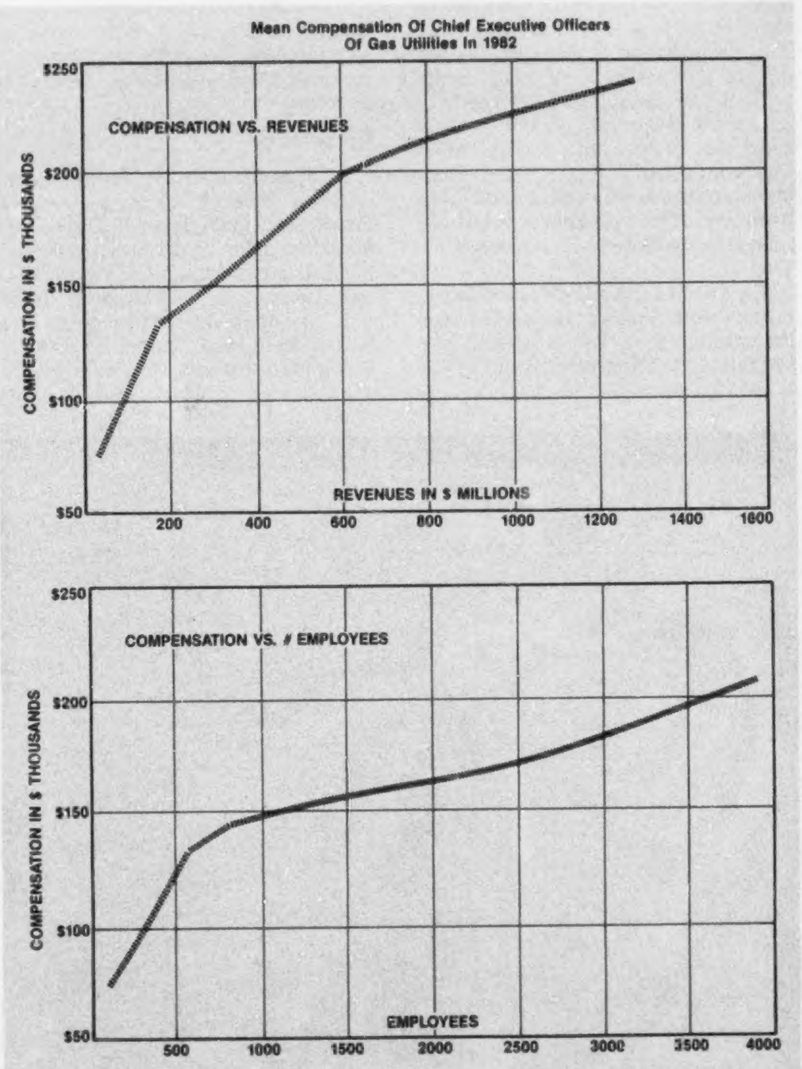
A newly published 1983 study of 1981 and 1982 gas distribution industry key executive compensation reveals that the movement of gas distribution companies toward establishment of holding companies—and their subsequent involvement in nonregulated businesses, is having a significant impact on executive compensation.

That is especially true with respect to compensation paid chief executive officers—and on employment of incentive compensation practices.

The four-part, 111-page analysis covers 68 investor owned gas distribution utilities, including 35 independent operating companies, three operating companies that are wholly-owned subsidiaries of utility holding companies, and 30 utility holding companies having gas distribution subsidiaries or companies with major gas distribution divisions.

Produced by Utilities Consulting Group of Washington, D.C., the report is based on reports submitted by the various companies themselves to the Securities & Exchange Commission, the Federal Energy Regulatory Commission, and to shareholders.

"Incentive compensaton for gas utility executives is far more extensive than for executives in electric utilities," notes David Marder, president of Utilities Consulting Group and author of the study. "Almost 41% of the gas distribution companies have incentive compensation programs—compared to less than 20% for electric utilities."



Mean Compensation Of Chief Executive Officers Of Gas Utilities In 1982

## Key Officer Compensation

Mean gross compensation (reflecting all cash and cash-equivalent sums, whether paid out or deferred) of chief executive officers among gas distribution companies in their 1982 fiscal years was about $150,000 with mean company size of approximately $230 million in annual revenues. The gross compensation for CEOs in 1982 ranged from a low of about $62,000 to a high of $600,000. The average gas industry CEO received an increase in gross compensation in 1982 of just under 20% over his 1981 compensation.

Mean gross compensation paid to chief operating officers of gas utilities in 1982 was approximately $110,000, a sum that, on the average, was about 70% of the compensation paid CEOs. Chief operating officers' compensation in 1982 ranged from a low of $51,000 to a high of $270,000 and the average COO re-

**MEAN COMPENSATION ACROSS THE GAS DISTRIBUTION INDUSTRY**

| Position/Responsibility | Mean 1982 Compensation | #Companies Surveyed | Mean Co. Size ($ mil.) |
|---|---|---|---|
| CEO | $150,000 | 60 | $230 |
| COO | 110,000 | 31 | 260 |
| Principal legal officer | 98,000 | 15 | 468 |
| Principal financial officer | 87,000 | 34 | 310 |
| Principal operations officer | 87,000 | 33 | 315 |
| Principal cust. serv. officer | 78,000 | 10 | 336 |
| Principal admin. officer | 74,000 | 9 | 417 |

ceived an increase in compensation of 22% in 1982 over his 1981 figure.

For other principal financial, operations, customer services, and administrative officers, the range in mean gross compensation reported paid is in a narrow range—from $74,00 to $87,000. The percentage increase in 1982 gross compensation over 1981 averaged 15.6%, indicating a widening of the gross compensation gap between the two top positions and all others.

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Seven officer positions or responsibilities and their compensations were reviewed for the report. They include:

| Position/Responsibility | Applicable Titles |
|---|---|
| Chief Executive Officer | Chairman; President |
| Chief Operating Officer | President; Exec. VP; Sr. VP |
| Principal financial officer | Exec. VP., Sr. VP., and VP-Finance; Controller |
| Principal legal officer | VP-Law; VP-Legal Affairs; Chief Counsel |
| Principal operations officer | Sr. VP. and VP-Operations |
| Principal administrative officer | Sr. VP. and VP-Administration or General Services |
| Principal customer services officers | Sr. VP. and VP. Consumer Services, Consumer Affairs, Commercial Ac-Activities, Marketing Services, etc. |

Not reflected in the study are perquisites or emoluments not reported by the companies themselves to constitute cash or cash equivalent disbursements (such as use of company-owned automobiles, club memberships, financial counseling, extra vacations, etc.) even though such perquisites may represent significant value to the recipients.

## Incentive Compensation

Some form of incentive compensation plan was reported to exist by 27 companies, or almost 41% of the companies covered in the study. Of these:

- 16 have stock option plans; most were modified in 1981 so that awards are incentive stock options and qualify for tax benefits under recent legislation.
- 22 have annual cash payment plans; most of these companies report that their plans allow cash incentive payments up to 50% of an individuals salary.
- 7 have multi-year cash payment plans

Among six companies where cash incentive awards were made in 1982, such awards represented an average of 21% of gross compensation of the five highest paid officers in each company.

The principal basis for awarding incentive payments were growth in earnings and in common stock prices.

## Deferred Compensation

About one of every three companies reported either a deferred compensation plan or arrangements for deferred compensation with individual officers. In two-thirds of these companies, the plans relate to a reasonably wide number of key personnel.

Eight companies with incentive compensation plans allow deferral of such awards. In 11 companies, deferred compensation plans do not require actual executive contribution from received or credited income, but are 100% company contributions. Essentially all plans provide payout at retirement, whether normal or due to disability. Payout periods tend to be fixed at five or ten years.

## Retirement Compensation

In four out of five companies, retirement compensation programs for officers are the same as for all company employees.

Compensation used in pension formulas is most often the average base salary over a five-year period, most often (46.2% of the time) over the last 10 years prior to retirement.

Supplemental retirement income plans were reported by 12 companies. Such plans either tend to increase retirement compensation (as a percentage of average compensation upon which retirement pay is based) and/or to reduce the number of years of credited service an officer must have to qualify for maximum retirement benefits.

The average level for maximum annual retirement pay as a percentage of compensation received during working years was just over 56%, with an average of approximately 36 years of credited service necessary to achieve the maximum pension.

## Directors' Compensation

Almost all of the companies (except subsidiaries) reported payment of annual (or monthly or quarterly) fees to outside directors. Excluding payments to outside chairmen, these payments ranged from $1000 to $18,000 with a mean of $6000. With a few exceptions, the size of the utility bore a reasonably direct relation to the amount of the fee paid.

Practically all companies reported paying board and committee meeting fees, normally drawing no distinction between the two. The mean fee was $400 per meeting, with almost 60% of the companies report fees in the $300 to $500 range.

One out of three gas companies allow directors to defer compensation. Four companies provide retirement pay for outside directors.

Inside directors (company officers) receive some fees for their services as directors in approximately one of every six companies.

*The report, "Executive Compensation Among Gas Utilities," is available at a price of $645 from Utilities Consulting Group, 1730 M Street, NW, Washington, D.C. 20036.*

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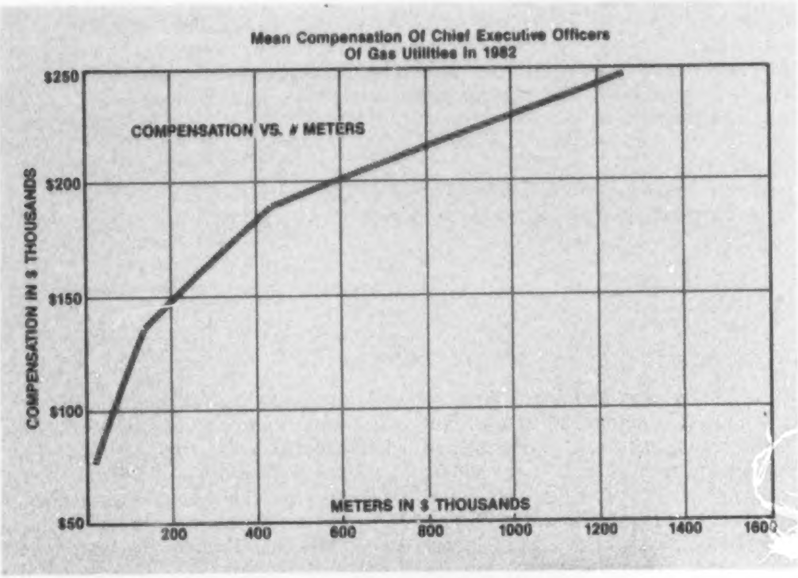

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## Second Quarter Report

# Improved refining, marketing operations boost earnings

The earnings picture brightened slightly during the second quarter of 1983, a welcome change for the oil industry after months of unprofitable reports.

Improved refined product margins, increased overseas oil and gas production, and an overall firming of prices are the primary reasons for the marked improvement.

The 94 oil companies responding to our survey report net income of $5.3 billion, a 9% increase over the same period in 1982. Profit margin for the group for the first and second quarters dropped to 3.6% from 3.8% last year.

Improved refining and marketing profit and reduced overhead expenses helped Exxon post a 26.6% earnings gain.

Atlantic Richfield's 4% drop in net income for the quarter was a result of a decrease in inventory profit, lower crude prices, and higher production and exploration expenses.

A 55% decline at Ashland Oil was blamed on lower profit margins from its largest business, oil refining and marketing, as well as continued impact of the recession on its chemicals, construction, and engineering and technology operations.

Getty Oil's earnings benefited from lower domestic and foreign exploratory costs, increased domestic crude-oil production, and higher earnings from insurance operations. Earnings for the quarter increased 4.5%.

Lower Mideast crude oil prices and improvements in refining and marketing operations world-wide combined for a 40% increase in net income at Mobil.

Phillips Petroleum reported 16% higher second quarter earnings, due primarily to higher natural gas liquids production, improved prices for natural gas and natural gas liquids, and increased crude oil production.

Standard Oil of California posted a 40% increase in net income, mainly as a result of firming of depressed petroleum product prices, the impact of reduced exploration expenses, and the acquisition of foreign crude oil on more competitive terms.

Standard Oil (Indiana) attributed 11.5% higher second quarter earnings to improved refined product margins and increased production of crude oil and natural gas overseas. Partially offsetting these gains were reduced market prices for crude oil and lower output of natural gas in the U.S.

Standard Oil (Ohio) reported slightly higher earnings, due to recovery of refining and marketing margins and increased volumes. The second quarter also benefited from anticipated first quarter sales of Alaskan crude oil which shifted into the second quarter because of delays in delivery.

Lower marketing and administrative expenses in Sun's U.S. refining and marketing operations resulted in a 23% earnings gain.

Tenneco reported slightly higher earnings even though its energy operations were hurt by a drop in

GAS COMPANIES' SECOND QUARTER FINANCIAL REPORTS

| | Three months ending June 30 | | | | | | Six months ending June 30 | | | | | | Profit Margin | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Revenues ($MIL) | | | Earnings ($MIL) | | | Revenues ($MIL) | | | Earnings ($MIL) | | | | |
| Company | 1983 | 1982 | %CHG | 1983 | 1982 | %CHG | 1983 | 1982 | %CHG | 1983 | 1982 | %CHG | 1983 | 1982 |
| Alabama Tennesee N.G. | 30.2 | 29.7 | 1.4 | 1.4 | 1.3 | 4.1 | 73.6 | 67.0 | 9.5 | 3.0 | 3.0 | 0.8 | 4.1 | 4.5 |
| American Nat. Resources | 744.5 | 683.4 | 8.9 | 31.4 | 33.2 | -5.4 | 1727.0 | 1746.7 | -1.1 | 92.3 | 94.5 | -2.3 | 5.3 | 5.4 |
| ARKLA[1] | 322.8 | 307.0 | 5.1 | 27.6 | 27.0 | 2.3 | 1324.1 | 1242.8 | 6.5 | 82.9 | 93.2 | -11.1 | 6.3 | 7.5 |
| Coastal Corp. | 1382.6 | 1336.1 | 3.5 | 31.1 | 15.8 | 96.8 | 2942.9 | 2900.7 | 1.5 | 45.2 | 21.8 | 107.1 | 1.5 | 0.8 |
| Columbia Gas | 964.5 | 994.3 | -3.0 | 25.7 | 38.8 | -33.7 | 2721.0 | 2869.8 | -5.2 | 92.3 | 131.1 | -29.6 | 3.4 | 4.6 |
| Consolidated Natural Gas | 726.3 | 628.7 | 15.5 | 30.2 | 25.3 | 19.6 | 1943.4 | 1829.2 | 6.2 | 134.5 | 111.9 | 20.2 | 6.9 | 6.1 |
| The El Paso Company | 984.3 | 1051.7 | -6.4 | 22.9 | 18.2 | 25.6 | 2207.1 | 2107.3 | 4.7 | 37.1 | 39.4 | -5.7 | 1.7 | 1.9 |
| ENSERCH | 802.2 | 901.5 | -11.0 | 9.8 | 36.1 | -72.8 | 1793.8 | 1905.9 | -5.9 | 49.0 | 93.3 | -47.4 | 2.7 | 4.9 |
| Equitable Gas | 95.6 | 78.5 | 21.8 | 13.7 | 4.3 | 221.1 | 428.6 | 407.7 | 5.1 | 37.5 | 36.8 | 1.9 | 8.7 | 9.0 |
| Houston Natural Gas[2] | 696.7 | 785.2 | -11.3 | 47.7 | 63.5 | -24.9 | 2239.9 | 2452.4 | -8.7 | 163.9 | 202.7 | -19.1 | 7.3 | 8.3 |
| InterNorth | 1058.1 | 718.2 | 47.3 | 32.2 | 24.9 | 28.9 | 2417.9 | 2167.5 | 11.6 | 134.1 | 133.3 | 0.6 | 5.5 | 6.1 |
| KN Energy[1] | 107.2 | 95.7 | 11.9 | 4.6 | 3.0 | 51.9 | 494.9 | 484.6 | 2.1 | 27.5 | 27.8 | -0.8 | 5.6 | 5.7 |
| Mountain Fuel Supply[1] | 362.0 | 299.7 | 20.8 | 41.5 | 34.3 | 21.1 | 616.0 | 516.9 | 19.2 | 55.6 | 42.7 | 30.3 | 9.0 | 8.3 |
| National Fuel Gas[3] | 211.8 | 184.7 | 14.7 | 5.4 | -0.1 | | 891.7 | 851.2 | 4.8 | 30.5 | 37.2 | -18.0 | 3.4 | 4.4 |
| Northwest Energy | 459.6 | 297.1 | 54.7 | -0.4 | 1.8 | | 1263.1 | 784.0 | 61.1 | 32.2 | 32.9 | -2.1 | 2.6 | 4.2 |
| NOVA, An Alberta Corp. | 922.4 | 858.1 | 7.5 | 36.5 | 31.0 | 17.7 | 1989.0 | 1588.0 | 25.3 | 69.1 | 58.4 | 18.3 | 3.5 | 3.7 |
| ONEOK inc. | 254.4 | 252.5 | 0.7 | 9.3 | 10.8 | -14.6 | 602.0 | 626.4 | -3.9 | 20.7 | 33.8 | -38.7 | 3.4 | 5.4 |
| Pacific Lighting | 1080.9 | 1006.7 | 7.4 | 41.7 | 32.5 | 28.3 | 2348.0 | 2181.2 | 7.6 | 74.2 | 61.2 | 21.1 | 3.2 | 2.8 |
| Panhandle Eastern | 732.8 | 792.4 | -7.5 | 26.9 | 62.6 | -57.0 | 1767.1 | 1749.1 | 1.0 | 88.5 | 136.0 | -34.9 | 5.0 | 7.8 |
| Peoples Energy | 386.6 | 322.2 | 20.0 | 12.8 | 6.6 | 93.9 | 1316.5 | 1391.3 | -5.4 | 51.3 | 58.2 | -11.9 | 3.9 | 4.2 |
| Pioneer Corp. | 258.5 | 254.8 | 1.5 | 20.1 | 16.6 | 20.8 | 547.2 | 577.2 | -5.2 | 41.6 | 46.5 | -10.5 | 7.6 | 8.1 |
| Sonat Inc. | 580.7 | 611.4 | -5.0 | 52.6 | 49.1 | 7.1 | 1426.9 | 1427.0 | -0.0 | 118.2 | 112.3 | 5.2 | 8.3 | 7.9 |
| Southern Union Co. | 242.0 | 249.4 | -3.0 | 2.8 | 1.2 | 128.7 | 587.7 | 593.9 | -1.0 | 16.7 | 14.3 | 16.8 | 2.8 | 2.4 |
| Texas Eastern Corp. | 1254.7 | 1412.0 | -11.1 | 31.0 | 42.8 | -27.6 | 2714.1 | 2836.6 | -4.3 | 68.6 | 104.7 | -34.5 | 2.5 | 3.7 |
| Texas Gas Resources | 640.3 | 673.3 | -4.9 | 4.8 | 28.4 | -83.0 | 1431.9 | 1456.6 | -1.7 | 29.6 | 58.2 | -49.1 | 2.1 | 4.0 |
| TransCanada Pipelines | 715.8 | 794.6 | -9.9 | 38.7 | 31.4 | 23.3 | 1639.3 | 1815.1 | -9.7 | 85.1 | 70.1 | 21.4 | 5.2 | 3.9 |
| Transco Energy Co.[1] | 885.5 | 964.1 | -8.1 | 24.9 | 41.8 | -40.5 | 4040.7 | 3585.9 | 12.7 | 113.0 | 147.7 | -23.5 | 2.8 | 4.1 |
| Union Gas Ltd. | 264.3 | 227.4 | 16.2 | 3.7 | 3.6 | 2.5 | 672.9 | 623.2 | 8.0 | 21.3 | 27.9 | -23.8 | 3.2 | 4.5 |
| United Energy Resources | 872.7 | 1375.1 | -36.5 | 12.3 | 54.2 | -77.4 | 2132.5 | 2950.0 | -27.7 | 51.9 | 118.4 | -56.2 | 2.4 | 4.0 |
| Westcoast Transmission | 178.0 | 215.6 | -17.4 | 15.9 | 18.2 | -12.6 | 510.0 | 639.9 | -20.3 | 33.1 | 37.7 | -12.2 | 6.5 | 5.9 |
| TOTAL | 18217.9 | 18401.3 | -1.0 | 658.7 | 758.2 | -13.1 | 46810.4 | 46375.1 | 0.9 | 1900.7 | 2186.8 | -13.1 | 4.1 | 4.7 |

[1] Twelve months [2] Nine months ending April 30 [3] Ends May 31

## OIL COMPANIES' SECOND QUARTER FINANCIAL REPORTS

| | Three months ending June 30 | | | | | | Six months ending June 30 | | | | | | Profit Margin | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Revenues ($MIL) | | | Earnings ($MIL) | | | Revenues ($MIL) | | | Earnings ($MIL) | | | | |
| Company | 1983 | 1982 | %CHG | 1983 | 1982 | %CHG | 1983 | 1982 | %CHG | 1983 | 1982 | %CHG | 1983 | 1982 |
| Adams Resources & Energy | 53.2 | 59.1 | -10.0 | 1.6 | 1.3 | 27.8 | 93.4 | 105.5 | -11.5 | 4.4 | 0.4 | 1002.0 | 4.7 | 0.4 |
| Adobe Oil & Gas | 61.4 | 69.9 | -16.9 | 5.4 | 5.8 | -6.6 | 83.1 | 103.7 | -19.9 | 11.1 | 11.7 | -5.2 | 13.4 | 11.3 |
| Amerada Hess | 1905.7 | 1780.4 | 6.9 | 68.2 | 61.1 | 11.7 | 3748.0 | 4153.6 | -9.8 | 73.2 | 44.9 | 63.0 | 2.0 | 1.1 |
| American Petrofina | 594.1 | 608.0 | -2.3 | 8.6 | 10.9 | -21.0 | 1018.4 | 1183.2 | -13.9 | 8.9 | 26.9 | -66.8 | 0.9 | 2.3 |
| American Quasar | 9.2 | 13.6 | -32.5 | -3.2 | -0.5 | | 20.7 | 28.6 | -27.1 | -3.7 | 1.5 | | | 5.1 |
| Anglo Energy[1] | 33.5 | 43.7 | -23.4 | -41.1 | -1.6 | | 116.7 | 156.6 | -25.8 | -62.5 | 8.3 | | | 5.3 |
| Argo Petroleum | 4.8 | 5.3 | -9.6 | -0.5 | -0.8 | | 10.1 | 11.0 | -8.9 | -1.3 | -1.4 | | | |
| [illegible] | 97.8 | 109.8 | -10.9 | 1.7 | 0.7 | 137.5 | 186.7 | 223.2 | -16.4 | -3.9 | | | | |
| Ashland Oil[1] | 2035.5 | 2199.4 | -7.5 | 31.0 | 69.1 | -55.2 | 5888.7 | 6779.3 | -13.1 | 45.6 | 105.0 | -56.6 | 0.8 | 1.5 |
| Atlantic Richfield | 6604.3 | 6915.9 | -4.5 | 393.4 | 409.8 | -4.0 | 12968.7 | 13450.4 | -3.6 | 723.7 | 795.2 | -9.0 | 5.6 | 5.9 |
| Beard Oil | 7.0 | 9.7 | -28.0 | -0.8 | 0.2 | | 15.4 | 18.8 | -18.4 | -1.1 | 0.6 | | | 3.4 |
| Buttes Gas & Oil | 31.9 | 29.6 | 7.7 | 0.3 | -1.3 | | 64.1 | 83.7 | -23.4 | 1.4 | 0.7 | 87.3 | 2.2 | 0.9 |
| Callon Petroleum[2] | 22.9 | 16.7 | 37.3 | 0.3 | 2.1 | -83.6 | | | | | | | | |
| Commonwealth Oil Refining | 6.8 | 101.9 | -93.3 | -3.6 | 2.6 | | 17.7 | 266.1 | -93.3 | -3.8 | -15.3 | | | |
| Consolidated O & G | 9.2 | 10.0 | -8.3 | 0.5 | -0.1 | | 18.7 | 21.6 | -13.3 | -0.7 | -2.3 | | | |
| Crown Central Petroleum | 352.2 | 415.6 | -15.3 | 3.6 | -3.2 | | 699.7 | 829.2 | -15.6 | -7.2 | -8.6 | | | |
| Crystal Oil | 45.1 | 45.1 | | -0.9 | -1.1 | | 94.1 | 106.1 | -11.3 | -1.3 | -1.9 | | | |
| Damson Oil[1] | 22.3 | 21.1 | 6.0 | 2.2 | 2.0 | 7.9 | 64.4 | 51.8 | 24.4 | 6.8 | 4.8 | 40.9 | 10.6 | 9.3 |
| Diamond Shamrock | 978.4 | 857.7 | 14.1 | 26.3 | 31.9 | -17.7 | 1833.8 | 1648.8 | 11.2 | 30.9 | 61.1 | -49.4 | 1.7 | 3.7 |
| Dorchester Gas[3] | 283.8 | 376.2 | -24.6 | 3.2 | 4.3 | -25.8 | 1110.3 | 805.5 | 37.8 | 11.6 | 13.8 | -17.1 | 1.0 | 1.7 |
| Dyco Petroleum | 10.9 | 14.3 | -23.3 | 1.9 | 3.9 | -52.2 | 23.7 | 28.5 | -17.1 | 4.2 | 7.8 | -46.0 | 17.9 | 27.4 |
| Energy Reserves Group | 34.6 | 39.6 | -12.5 | 2.9 | -0.9 | | 73.0 | 81.8 | -10.7 | 6.4 | -0.3 | | 8.8 | |
| Enstar Corp. | 58.8 | 84.4 | -30.3 | 2.0 | 9.0 | -77.8 | 152.6 | 179.5 | -15.0 | 13.2 | 19.5 | -32.3 | 8.7 | 10.9 |
| Equity Oil | 5.3 | 5.7 | -7.2 | 1.1 | 0.5 | 134.0 | 10.8 | 11.8 | -7.8 | 2.2 | 1.7 | 31.0 | 20.6 | 14.5 |
| Exeter Oil | 1.1 | 1.1 | 0.4 | 0.2 | 0.2 | -5.9 | 2.2 | 2.1 | 1.3 | 0.3 | 0.4 | -17.5 | 13.7 | 16.8 |
| Exxon | 22881.0 | 25121.0 | -8.9 | 1075.0 | 849.0 | 26.6 | 46586.0 | 51962.0 | -10.3 | 2135.0 | 1688.0 | 26.5 | 4.6 | 3.2 |
| Felmont | 17.7 | 21.2 | -16.3 | 2.5 | 4.3 | -42.3 | 39.2 | 39.2 | -0.1 | 6.7 | 7.1 | -6.0 | 17.1 | 18.2 |
| Forest Oil Corp. | 29.5 | 36.8 | -19.7 | 1.4 | 1.8 | -24.6 | 66.4 | 75.9 | -12.4 | 5.4 | 5.2 | 3.0 | 8.1 | 6.9 |
| Freeport McMoRan | 186.2 | 175.0 | 6.4 | 19.4 | 15.4 | 25.9 | 390.4 | 369.9 | 5.5 | 40.5 | 41.9 | -3.4 | 10.4 | 11.3 |
| Galaxy Oil | 3.0 | 3.5 | -13.9 | -0.6 | -0.8 | | 6.3 | 6.9 | -8.5 | -1.0 | -1.4 | | | |
| Getty Oil | 3006.6 | 3106.5 | -3.3 | 163.7 | 156.6 | 4.5 | 6025.5 | 6269.2 | -3.9 | 321.3 | 336.2 | -4.4 | 5.3 | 5.4 |
| Gulf Energy & Dev. | 27.9 | 18.8 | 48.6 | 1.0 | 1.1 | -3.6 | 58.0 | 34.2 | 69.6 | 2.3 | 1.5 | 52.7 | 3.9 | 4.4 |
| Gulf Oil Corp. | 6987.0 | 7416.0 | -5.8 | 223.0 | 227.0 | -1.8 | 13885.0 | 14951.0 | -7.1 | 405.0 | 815.0 | -21.4 | 2.9 | 3.4 |
| Hadson Petroleum | 7.2 | 8.8 | -17.6 | 1.8 | 4.0 | -54.6 | 11.9 | 19.3 | -38.2 | 2.9 | 9.2 | -68.9 | 24.0 | 47.7 |
| Hadson Petroleum | 7.2 | 8.8 | -17.6 | 1.8 | 4.0 | -54.6 | 11.9 | 19.3 | -38.2 | 2.9 | 9.2 | -68.9 | 24.0 | 47.7 |
| Hamilton Bros. Petroleum | 30.5 | 34.8 | -12.4 | 7.5 | -1.6 | | 76.1 | 89.0 | -14.5 | 10.9 | 4.3 | 151.7 | 14.4 | 4.8 |
| Harken Oil & Gas | 1.4 | 1.2 | 22.5 | 1.4 | -0.5 | | 2.9 | 2.6 | 10.5 | 1.3 | -0.8 | | 46.3 | |
| Helmerich & Payne | 51.8 | 89.0 | -41.8 | 10.4 | 18.6 | -43.8 | 184.7 | 279.5 | -33.9 | 37.2 | 62.2 | -40.1 | 20.2 | 22.2 |
| Hershey Oil | 1.8 | 1.8 | -0.2 | 0.1 | 0.1 | 17.5 | 3.6 | 3.6 | -0.2 | 0.4 | 0.4 | 19.9 | 11.7 | 9.7 |
| Holly Corp[4] | 113.1 | 107.2 | 5.5 | 2.0 | 1.4 | 40.6 | 239.0 | 238.4 | 0.3 | 5.0 | 7.2 | -30.5 | 2.1 | 3.0 |
| Howell Corp. | 33.3 | 63.9 | -47.9 | 0.3 | 0.8 | -66.8 | 73.9 | 130.8 | -43.5 | 0.4 | 1.6 | -77.0 | 0.5 | 1.2 |
| Howell Petroleum | 15.7 | 20.9 | -24.9 | 2.0 | 2.5 | -19.1 | 38.0 | 43.7 | -13.0 | 4.5 | 4.5 | -0.5 | 11.8 | 10.3 |
| Inexco Oil | 43.4 | 55.7 | -22.1 | 3.1 | 4.4 | -29.9 | 86.0 | 118.5 | -27.5 | 5.8 | 12.0 | -51.9 | 6.7 | 10.1 |
| KRM Petroleum | 0.9 | 1.3 | -29.9 | | | | 2.0 | 2.7 | -24.9 | | 0.2 | | | 6.2 |
| Lear Petroleum | 55.1 | 48.2 | 14.2 | 4.0 | 0.5 | 712.7 | 109.2 | 102.9 | 6.1 | 8.7 | -1.3 | -783.0 | 7.9 | -1.2 |
| Louisiana Land & Exp. | 311.0 | 310.4 | 0.2 | 24.3 | 20.4 | 19.0 | 564.3 | 614.7 | -8.2 | 50.9 | 33.8 | 50.4 | 9.0 | 5.5 |
| Mapco Inc. | 507.9 | 481.8 | 5.4 | 11.0 | 17.9 | -38.4 | 977.3 | 962.7 | 1.5 | 20.8 | 33.9 | -38.6 | 2.1 | 3.5 |
| May Petroleum | 6.4 | 7.5 | -15.2 | -0.1 | 0.3 | | 15.1 | 15.1 | 0.3 | -1.7 | 1.0 | | | 6.5 |
| Maynard Oil | 6.6 | 8.1 | -18.5 | -1.4 | -1.7 | | 15.5 | 19.5 | -20.4 | -1.7 | -0.6 | | | |
| McFarland Energy | 3.8 | 3.7 | 2.3 | 1.0 | 0.8 | 20.2 | 7.6 | 7.5 | 1.3 | 1.9 | 1.8 | 9.1 | 25.7 | 23.8 |
| Mesa Petroleum | 101.2 | 99.8 | 1.4 | 18.1 | 35.9 | -49.7 | 207.9 | 204.0 | 1.9 | 58.8 | 69.1 | -14.9 | 28.3 | 33.9 |
| Mobil Corp. | 14402.0 | 15790.0 | -8.8 | 402.0 | 287.0 | 40.1 | 28690.0 | 32191.0 | -10.9 | 652.0 | 531.0 | 22.8 | 2.3 | 1.6 |
| Moran Energy | 19.9 | 24.3 | -18.3 | 0.8 | 1.8 | -56.5 | 43.9 | 53.4 | -17.8 | 2.2 | 5.9 | -63.1 | 5.0 | 11.1 |
| Murphy Oil | 618.2 | 598.6 | 3.3 | 40.4 | 41.7 | -3.2 | 1329.2 | 1342.9 | -1.0 | 68.2 | 75.1 | -9.1 | 5.1 | 5.6 |
| Natomas | 623.5 | [illegible] | 4.4 | 39.6 | 46.3 | -14.6 | 770.1 | 795.3 | -3.2 | 33.0 | 96.2 | -65.7 | 4.3 | 12.1 |
| Noble Affiliates | 70.3 | 107.7 | -34.7 | 5.9 | 20.2 | -71.1 | 167.8 | 222.4 | -33.5 | 12.9 | 42.7 | -69.7 | 8.7 | 19.2 |
| Norris Oil | 0.7 | 0.7 | 10.1 | 0.1 | 0.1 | | 1.4 | 1.3 | 8.0 | 0.1 | 0.1 | | 6.9 | 7.5 |
| Nugget Oil Corp. | 9.7 | 7.0 | 38.3 | 6.8 | 0.5 | 740.9 | 0.6 | 3.7 | -82.6 | 6.7 | 0.3 | 2027.6 | 1040.7 | 8.5 |
| [illegible] | 11.0 | 8.9 | 23.8 | 2.2 | 1.7 | 23.5 | 22.6 | 16.4 | 38.4 | 4.2 | 3.4 | 22.1 | 18.5 | 21.0 |
| Patrick Petroleum | 16.4 | 24.8 | -33.9 | -2.0 | -1.7 | | 34.9 | 49.9 | -30.0 | -1.9 | -1.7 | | | |
| Peninsula Resources | 2.3 | 3.6 | -35.4 | -2.0 | -1.8 | | 4.6 | 10.1 | -54.7 | 4.0 | 2.4 | 67.8 | 86.9 | 23.5 |
| Pennzoil Co. | 567.4 | 588.7 | -3.6 | 28.3 | 43.8 | -35.3 | 1127.2 | 1175.9 | -4.1 | 68.6 | 82.7 | -17.0 | 6.1 | 7.0 |
| Petroleum Devel. | 3.0 | 4.0 | -24.9 | 0.1 | -0.1 | | 8.3 | 6.3 | 33.5 | 0.4 | -0.4 | | 4.5 | |
| Phillips Petroleum | 3789.0 | 4028.0 | -5.9 | 169.0 | 146.0 | 15.8 | 7426.0 | 7833.0 | -5.2 | 298.0 | 338.0 | -11.8 | 4.0 | 4.3 |
| Prairie Producing Co. | 4.8 | 6.4 | -25.7 | 0.9 | 0.7 | 33.8 | 9.4 | 13.5 | -30.6 | 1.5 | 2.1 | -27.8 | 16.4 | 15.7 |
| Quaker State | 245.6 | 249.2 | -1.5 | 12.1 | 14.0 | -13.9 | 458.8 | 473.2 | -3.0 | 18.2 | 19.8 | -8.1 | 4.0 | 4.2 |
| Sabine Corp. | 25.6 | 48.7 | -47.3 | 3.2 | 7.7 | -58.8 | 58.2 | 96.5 | -39.7 | 29.2 | 13.4 | 118.2 | 50.2 | 13.9 |
| Seneca Oil | 3.8 | 5.3 | -29.1 | 2.0 | 1.3 | 58.9 | 8.9 | 10.8 | -17.9 | -3.3 | -1.9 | | | |
| Shell Oil | 4872.0 | 5105.0 | -4.6 | 390.0 | 380.0 | 2.6 | 9517.0 | 9947.0 | -4.3 | 636.0 | 724.0 | -12.2 | 6.7 | 7.3 |
| Southland Royalty | 79.8 | 92.9 | -14.1 | 6.4 | 8.8 | -27.2 | 162.2 | 187.7 | -13.6 | 15.1 | 16.8 | -9.9 | 9.3 | 8.9 |
| Standard California | 7092.0 | 9370.0 | -24.3 | 368.0 | 263.0 | 39.9 | 14087.0 | 19390.0 | -27.3 | 678.0 | 493.0 | 37.5 | 4.8 | 2.5 |
| Standard Indiana | 7422.0 | 7558.0 | -1.8 | 426.0 | 382.0 | 11.5 | 14882.0 | 14723.0 | 1.1 | 825.0 | 852.0 | -3.2 | 5.5 | 5.8 |
| Standard Ohio | 3101.0 | 3379.0 | -8.2 | 476.0 | 473.0 | 0.6 | 5867.0 | 6996.0 | -16.1 | 753.0 | 928.0 | -18.9 | 12.8 | 13.3 |
| States Petroleum[5] | 3.5 | 3.7 | -6.9 | -0.7 | 0.8 | -185.0 | 6.5 | 7.1 | -8.8 | -0.7 | 1.4 | | | 19.3 |
| Summit Energy | 1659.3 | 2152.2 | -22.9 | -155.3 | -40.0 | | 3689.7 | 4442.0 | -16.9 | -84.5 | 46.4 | | | 1.0 |
| Sun Co. | 3780.0 | 4160.0 | -9.1 | 134.0 | 109.0 | 22.9 | 7520.0 | 8210.0 | -8.4 | 223.0 | 232.0 | -3.9 | 3.0 | 2.8 |
| Superior Oil | 418.6 | 505.9 | -17.3 | 36.7 | 76.9 | -52.2 | 876.1 | 1036.6 | -15.5 | 60.4 | 160.3 | -62.3 | 6.9 | 15.5 |
| Tenneco | 3566.0 | 3686.0 | -3.3 | 189.3 | 188.5 | 0.4 | 7175.0 | 7452.0 | -3.7 | 284.4 | 301.9 | -5.8 | 4.0 | 4.1 |
| Tesoro Petroleum[1] | 712.2 | 556.3 | 28.0 | 10.6 | 16.7 | -36.6 | 1829.8 | 1806.2 | 1.3 | 23.1 | 30.6 | -24.6 | 1.3 | 1.7 |
| Texaco Inc. | 9500.0 | 11500.0 | -13.9 | 327.0 | 305.0 | 7.2 | 20100.0 | 24500.0 | -18.0 | 646.0 | 672.0 | -3.9 | 3.2 | 2.7 |
| Texas American Energy | 43.3 | 45.1 | -4.1 | -1.2 | -1.8 | | 116.7 | 114.8 | 1.6 | 1.4 | 0.2 | 713.6 | 1.2 | 0.1 |
| Texas International | 41.3 | 45.7 | -9.5 | 4.0 | 3.7 | 8.1 | 76.3 | 90.4 | -15.6 | 4.2 | 7.0 | -39.7 | 5.5 | 7.7 |
| Tosco Corp | 748.5 | 827.2 | -9.5 | -194.5 | 106.7 | | 1473.7 | 1650.2 | -10.7 | 241.1 | 107.2 | 124.9 | 16.4 | 6.5 |
| Total Petroleum N.A. | 509.7 | 551.7 | -7.6 | -16.5 | -5.4 | | 1010.8 | 1096.1 | -7.8 | -53.6 | 0.8 | | | 0.1 |
| Transcontinental Energy | 6.2 | 13.7 | -54.7 | 3.7 | 0.5 | 717.7 | 15.6 | 30.0 | -48.2 | 7.4 | 0.7 | 924.3 | 47.9 | 2.4 |
| Union California | 2807.0 | 2909.7 | -3.5 | 139.4 | 197.6 | -29.5 | 5281.0 | 5391.3 | -2.0 | 267.7 | 366.1 | -26.9 | 5.1 | 6.8 |
| Universal Resources | 11.2 | 14.5 | -22.8 | -0.6 | 2.2 | -128.4 | 23.8 | 31.6 | -24.7 | -1.3 | 5.2 | -124.0 | -5.3 | 16.6 |
| Wainoco Oil | 10.0 | 12.7 | -21.3 | 0.1 | -3.7 | | 27.9 | 26.3 | -12.9 | 1.2 | -6.4 | | 5.1 | |
| Wichita Industries | 2.1 | 2.9 | -28.1 | 0.2 | 0.2 | -6.1 | 4.2 | 5.0 | -16.7 | 0.2 | -0.2 | | 5.8 | |
| Wilshire Oil of Texas | 2.2 | 3.3 | -32.9 | 0.4 | 0.4 | 19.7 | 5.0 | 6.3 | -20.6 | 1.2 | 0.6 | 83.9 | 23.5 | 10.2 |
| Wiser Oil | 11.6 | 12.0 | -3.0 | 2.4 | 3.5 | -32.6 | 25.8 | 25.8 | | 6.3 | 7.1 | -11.5 | 24.5 | 27.7 |
| Woods Petroleum | 16.7 | 20.8 | -19.7 | 3.0 | 5.9 | -49.2 | 35.2 | 41.2 | -14.5 | 7.7 | 11.7 | -33.9 | 21.9 | 28.3 |
| Worldwide Energy | 21.3 | 12.2 | 74.1 | -2.8 | -0.9 | 221.8 | 38.9 | 26.4 | 47.5 | -1.4 | -1.0 | 39.9 | -3.6 | -3.8 |
| TOTAL | 114753.1 | 125522.7 | -8.6 | 4934.8 | 5053.3 | -2.3 | 232024.6 | 258472.8 | -10.2 | 9726.3 | 10091.7 | -3.6 | 4.2 | 3.9 |

[1] Nine months. [2] Year ends May 31. [3] Ends May 31. [4] Ends Jan. 31. [5] Ends April 30. [6] Ends Sept. 30.

natural gas production, an industry wide surplus of gas, and a soft market.

Firming of spot market prices for crude oil and OPEC's establishment of production ceilings boosted Texaco's earnings 7% over the previous year.

Lower domestic natural gas production and prices and sagging earnings performances by its refining, marketing and chemical operations accounted for Union Oil of California's 30% drop in net income.

Adobe Oil & Gas posted a 6.6% drop in earnings due to a slowdown in exploration.

A decline in the volume of natural gas produced, reflecting curtailments by pipeline purchasers, was primarily responsible for American Petrofina's 21% decline in net income.

Anglo Energy reported a $41 million loss for the quarter as a result of disposition of various operating units in the Supply and Equipment Division and a write-down of oil and gas properties.

A decline in oil and gas sales as well as drilling and well servicing revenues adversely affected Beard Oil's second quarter results, posting a $1.1 million loss.

Crown Central Petroleum realized a net profit of $3.9 million compared to a net loss in 1982. Improvement was due mainly to increases in margins for refined products.

Economic pressures in the petroleum industry continued to hamper Crystal Oil's operations, resulting in a net loss for the quarter.

Enstar's 78% drop in earnings was due principally to curtailed liquefied natural gas production and lower oil and LNG prices in Indonesia.

A decline in natural gas production was blamed for Forest Oil's 25% decline in net income.

The decreased demand for natural gas also hindered Gulf Energy & Development's second quarter earnings which dropped 3.6%.

Howell Corp.'s 67% decline in net income resulted from continued weakness of conventional fuel product prices.

A decrease in dry holes and exploratory charges combined to produce a 19% increase in earnings at Louisiana Land & Exploration.

Mesa Petroleum reported net income of $15.1 million compared to $32.2 million last year.

Losses sustained by contract drilling operations were primarily responsible for Moran Energy's 56% decrease in earnings.

Natomas said its 14.5% drop in net income was due to increased Indonesian finding and development costs, as well as lower petroleum prices and production.

Net earnings declined 71% at Noble Affiliates as a result of decreases recorded by three operating units: oil and gas, contract drilling, and trucking.

Sharply lower coal sales, reduced oil and gas sales, and a materials inventory write-down were major contributors to the loss reported by Patrick Petroleum.

Pennzoil said reduced natural gas sales and pipeline delays in calculating and paying amounts contractually owed because of reduced 1982 takes adversely affected second quarter earnings which dropped 35%.

Lower depreciation and amortization due to higher estimated recoverable reserves of oil and gas increased Prairie Producing's net income 34%.

Southland Royalty's earnings dropped 27% due to continued reduced demand for natural gas.

Superior Oil's second quarter earnings were hampered by lower domestic oil and gas prices and volumes, and dry hole costs significantly above those of last year. Net income fell 52%.

*(Continued)*

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Tosco posted a net loss of $194.5 million for the quarter due to noncash charges for revaluations of assets at the company's Duncan, Okla. and Bakersfield, Calif. refineries which are for sale.

Wainoco Oil turned a net loss in 1982 into a $101,000 gain in 1983 due to lower depreciation and depletion, reduced interest charges, and lower general and administrative costs.

The 30 gas companies responding to our survey reported a 10% decline in net income for the second quarter as a result of lower natural gas demand. Profit margin for the group remained unchanged from the 3.9% posted last year.

American Natural Resources said its 159% increase in earnings was achieved mainly by transporting additional gas for others, implementing operating efficiencies, and establishing lower prices for purchases of deregulated gas.

Coastal Corp. reported a 97% increase in net income reflecting increased margins in its refining and marketing segment and the addition of the Wyoming Interstate gas pipeline system.

Colder weather in the Consolidated Natural Gas operating area is the main reason for their 20% increase earnings.

The nationwide excess deliverability of natural gas continued to supress Enserch's natural gas sales and associated production of condensate and gas liquid, reducing income 73%.

KN Energy said higher rates helped offset the decline in gas sales on the interstate system, resulting in 52% increase in earnings.

Peoples Energy's net income for the quarter was aided by higher rates and colder weather. Earnings increased 21%.

The main reason for Pacific Lighting's improved results this quarter were improvements in utility and energy-related operations. Net income rose 28%.

Lower prices for North Sea crude oil and weak overall fuel demand stemming from a sluggish U.S. economy continued to adversely affect Texas Eastern's earnings, causing 28% decrease.

United Energy Resources' operations were adversely affected by the economy and the current excess deliverability of gas supply, as net income dropped 77%. ■

# FINANCIAL NOTEBOOK

**Capital appropriations** by the petroleum industry in the second quarter fell 17.6% from the first quarter. Appropriations by nonpetroleum firms increased 14.7% for the quarter, according to The Conference Board.

Capital spending by the industry was $5.2 billion, down 3.3% from the previous quarter. Spending prospects for 1983 continue to be weak, they report, with petroleum outlays expected to dip by 23%, compared to a 7% drop by nonindustry manufacturers.

Cancellations and adjustments of previously approved appropriations amounted to $949 million in the second quarter, mostly in the petroleum industry.

**Contracts.** C F Braun was awarded a subcontract to design a process plant to produce liquefied petroleum gas at Tanjung Ugan, Indonesia by Nippon Steel. Toyo Menka Kaisha and Nippon Steel hold the prime contract with Pertamina, the Indonesian state oil company, and are responsible for procurement and construction.

Shell UK Exploration and Production awarded an offshore oilfield service contract to Gearhart Geodata Services (Aberdeen, Scotland). Contract involves the provision of high-technology "measurement while drilling" services by Gearhart to the majority of Shell's North Sea rigs and production platforms.

Total Oil Marine (France) awarded a $68 million contract to a joint venture Scottish shipyard to build a North Sea oil platform.

Zamel & Turbag/Brown & Root Al Khobar (Saudi Arabia) signed contracts with Aramco to provide construction management for various projects in the Eastern Province at Dhahran.

Texas International signed a contract with Celeron (Goodyear Tire & Rubber) for the transportation and sale of its Eloi Bay Field deep Miocene natural gas.

Ebasco Services (Enserch) was awarded a contract to provide construction and related services for an ongoing maintenance, repair, and modification program at Public Service of Colorado's Fort St. Vrain Nuclear Power Station.

**Mergers/acquisitions.** Mesa Petroleum agreed to sell its 3.98 million Superior Oil common shares back to Superior at $42/share.

Western Mining Corporation Holdings (Australia) will acquire all of the issued and outstanding shares of Mesa Australia for $35.4 million.

Under a previously announced merger agreement, Gulf Energy & Development became a unit of Penn Central.

Suburban Propane Gas entered into a definitive agreement with Proco Holding under which SPG will merge with a Proco unit.

**Properties acquired.** Apache Petroleum acquired an average 82% working interest in 34 production oil wells in the Riffe field in north central Kansas for $31.9 million. Interests were acquired from a group of companies including: C.C. & S. Oil Operations (Hayes, Kan.); Search Natural Resources (Denver, Colo.); Colorado Crude Explorations (Denver, Colo.); and Western Energy (Williston, N.D.).

Damson Oil acquired an overriding royalty interest in proved developed reserves estimated to yield 2.49 million bbl of oil from Antelope Co.

**Joint ventures.** Tenneco Oil Exploration and Production, Philadelphia Life Insurance (Tenneco), and Wilhelm Wilhemsen (Oslo, Norway) agreed to a joint venture under which about 20 vessels will be used to support Tenneco Oil's exploration and production activities in the Gulf.

**Projects.** Mark Producing announced the fabrication and installation of an 8-pile offshore platform for the drilling and producing of up to 24 oil/gas wells on South Marsh Island off the Louisiana coast.

**Briefs.** Frontier Pipeline is accepting tenders for shipment through its 290-mile crude petroleum pipeline in Utah and Wyoming.

Amoco Production plans an extensive in-fill drilling program to further develop its east and west Hackberry fields in Cameron Parish, La. ■